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The IRON AGE

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Durable Rebuilding

YOU remember that famed old "one hoss shay," the vehicle that went to pieces all at once and all over when its time of service was up. Wheels and body, shafts, axles and bearings all disintegrated simultaneously in a mutual void of obsolescence.

From the standpoint of some modern designers, this accomplishment of having had nothing left over when the period of service was finished was the attainment of the ultimate in engineering. One manufacturer told me quite seriously some time ago that ball and roller bearings used in automobiles were too long lived in relation to the life of the vehicles they equipped. Judging by the "graveyards" we find scattered throughout the country, there are other parts and accessories equally over-durable.

Some students, as well as economic professors, would take issue with this thought of downgrading the life expectancy of components so that they parallel the life span of the product itself. They say that the opposite principle is the correct one; namely, to improve the wearing quality of the weaker parts so as to increase the expectable term of service of the product as a whole. From the standpoint of sound economics, they say, if our aim is "more goods for more people", then making what we have last longer will give us the necessary purchasing power to buy a greater variety of commodities.

There are other economists of equal standing who say that in practice this policy of extending the life span of products would cause the stagnation of industry and trade as we have come to know them. They point to the yearly model policy of the automobile industry and ask where the five million cars a year output would have been, had there not been annual style and design changes that made people want to turn in their vehicles after twelve months of service. Or what would happen to the millinery business if women would be willing to wear the same hat for six years instead of six months.

I must confess that the answer to these questions is beyond my power. Perhaps both policies have their merits as applied to their special provinces.

When it comes to rebuilding in the postwar world, the rebuilding of the destroyed homes and industrial plants abroad and the new building of homes and plants in our own country, I look and hope for the acceptance of the principle of durability. We want low cost housing but not shoddy houses. We want modern design in our machine tools and manufacturing equipment but we want also the durability and serviceability that will enable them to stand up and take it, and to take it long enough to return a good profit on their cost.

So far as our own metal working industry is concerned, I do not believe that there will be any change in the objective of serviceability of product, whatever it may be. And serviceability takes into consideration the factor of durability. When we forget to strive to make things last well, as well as serve well, we will be heading down the wrong road.

J. H. Van Deventer



Longitudinal body seams are securely clamped before resistance welding.

Powder boxes must keep a fighting ship's powder dry.



How the Navy Keeps Its Powder Dry

Stored deep in the holds of Allied fighting ships are water-tight boxes—each containing 100 lbs. of powder. These powder boxes must withstand hard usage, stack easily and keep precious powder in condition for instant use by our fighting men. Thousands have been made of Inland hot-rolled pickled and oiled sheets.

They are of welded construction, and galvanized inside and outside for full protection. The opening in the top is sealed with a gasket drawn tight by a hand screw and spider. The bodies are formed from 16-ga. sheets.



Tops and bottoms are made of 13-ga. sheets. The tops are formed in four operations—blank and punch opening, deep draw to 2-3/4" and emboss opening, trim corners and roll back edges. The excellent working qualities of Inland sheets help speed production and save time and materials.

When Victory is ours, the modern Inland continuous sheet and strip mills, which now are producing at full capacity for the war effort, will again be making sheet and strip for hundreds of peacetime products.

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► Since acquisition of control by New York investment banking interests, La Consolidada, whose main plant is at Mexico City, has been shopping for two 25 or 50 ton electric furnaces and a blooming mill. These would complement its 50 ton open hearth at Piedras Negras, just across the Texas border, to take advantage of Texas scrap.

A blast furnace at Monclava, operated by Altos Hornos, also promises to be a Texas scrap consumer. Principal Mexican operation, however, continues to be Fierro y Acero de Mexico at Monterrey.

► Permanente Metals Corp.'s plans to produce ferrochrome now depend on the securing of WPB authority for a \$100,000 dust collector installation. By a new process, ferro-silicon will be used to reduce iron content in low grade chrome ore.

► Captured German airfields show that they carried camouflage to incredible lengths during the four-year occupancy of France and Belgium. Hangars and other installations, often remote from the landing field, follow the lines of local architecture so closely that even from the ground they are indistinguishable from other farm buildings and houses of the countryside.

Each house exactly fitted an airplane. They really are houses, with central heating and interior comforts for the air and ground crew who lived in them along with their aircraft.

► Intense anti-aircraft fire has always been a major German defense weapon. These installations do not take nearly the manpower that would be normally expected. Banks of weapons are loaded mechanically, and fire is controlled automatically by radar, which has been developed to a very high efficiency.

► Manpower stringency is so great that the Luftwaffe Command has replaced male members of observation posts with 15 to 19-year old girls in the Alps, Southern and Central Germany. With only a few weeks' training in aircraft recognition, these girls are unable frequently to distinguish between friendly and unfriendly aircraft. Thus, in several recent instances, targets inside the Reich have been attacked before a warning is received.

► Some observers believe that when the mines of the Saar Basin and the Ruhr are captured that important underground aircraft factories will be found among them. However, these deep workings are not suitable for parts construction, and even though a number of months ago some mines were selected and conversion work actually started there is evidence that the plan was abandoned.

However: Numerous salt mines and deep quarries in Germany have undoubtedly been converted to aircraft plants, with armored concrete roofs even more substantial than those employed over submarine pens. The pumping and ventilation problems for such underground factories would not be nearly so formidable as would be the case for the Ruhr mines.

► The German jet-propelled aircraft, Me 262 and He 280, are undoubtedly made in underground factories absolutely secure from bombing, for these airplanes represent Germany's last hope in the air. Many of the jet plants also are distributed among the mountain valleys of Austria, and soon will be threatened by the Russian drive.

► The British 6-ton bomb was originally made up of three cylindrical containers fixed end-to-end like sausages. It now has been fully streamlined and has penetration as well as blast effect.

Used against German submarine pens, a bomb of this type was found to have actually pierced 12 ft. of steel and concrete roof. Recently, a similar bomb falling on the deck of the Tirpitz finished it off.

► Copper supplies are increasing rapidly despite WPB moves to relieve restrictions on civilian uses. Newly authorized items of civilian consumption represent insignificant tonnages, meanwhile, domestic premium payments and foreign imports continue.

► Aluminum at 15c. per lb. holds encouraging postwar market prospects that producers are attempting to capitalize. The Reynolds Metals Co. has been developing anodized coatings for their products.

Broaching vs. Milling

In Manufacturing Rifle Parts

... In three years, the substitution of broaching for milling operations on the Garand semi-automatic M1 rifle has resulted in a decrease of 57 per cent in the cost of manufacture and 50 per cent in the number of manhours required. A complete analysis of comparative capital costs for equal production is given. In the first part of a five-part article, after discussing general considerations, the author describes the broach tooling for the heaviest part of the rifle, the receiver. The principles of broaching economy illustrated by these particular examples apply equally well to any high production work on parts of comparable weight.

ON July 28, 1944, Springfield Armory, Springfield, Mass., released the information that Col.

George A. Woody, Commanding Officer, witnessed the stamping of the 3,000,000th serial number on the receiver of the semi-automatic M1 rifle. Production records at the Armory show that the output of the SARM1 (semi-automatic rifle M1) in the last five years approached the total of all small arms made at the arsenal in the 145 years from 1794 to 1939, which reached a total of 3,822,743 guns of various types before the M1 rifle went into mass production, thus setting a production record unequalled in the 150 years of its existence.

There have been times in the Armory history when the output of shoulder arms in an entire year did not reach that of the M1 rifle in a single day at the peak of Armory production, which increased to more than 100,000 a month.

Actually, the semi-automatic "U. S. Rifle, Cal. .30, M1", generally known as the Garand, has been in production since 1937, but in the first two years of production output was limited due to the conventional procedure of manufacture. Late in 1937, however, a program was inaugurated to retool this rifle, utilizing the most modern machine tools and layout processes which would permit rapid expansion in the event of an emergency. Records show that the adoption of the most modern methods and particularly the broad use of sur-

By I. A. SWIDLO
Head Engineer, Production Engineering
Department, Springfield Armory, Springfield, Mass.

o o o

face broaching machines resulted in a decrease of 57 per cent in the cost of manufacturing the Garand rifle in three years, and a reduction of 50 per cent in the number of manhours required only a year and a half ago to fabricate each rifle.

It is not generally known that these successful results were obtained largely due to the extensive use of surface broaching machines and in this article the manufacture of a few typical components for the Garand rifle will be reviewed, with special emphasis on the use of broaching for machining, showing the savings in capital investment, manpower, and floor space.

As early as 1935 the writer began a study of utilizing surface broaching machines for manufacturing small rifle parts. With the assistance of the Cincinnati Milling Machine Co., the first study was completed and preliminary processes were laid out. The basic principal adopted at that time was to avoid using hand milling and hand profiling, and improve upon existing power milling methods by using broaching machines, but only if they were the most economical and made possible the high production desired.

For over two years this material was dead filed until the Garand rifle was adopted by the Army as the U. S. Rifle, Cal. .30, M1. The urgent need for exceptionally large quantities of this rifle in the shortest possible time prompted the restudy of the originally proposed broaching methods.

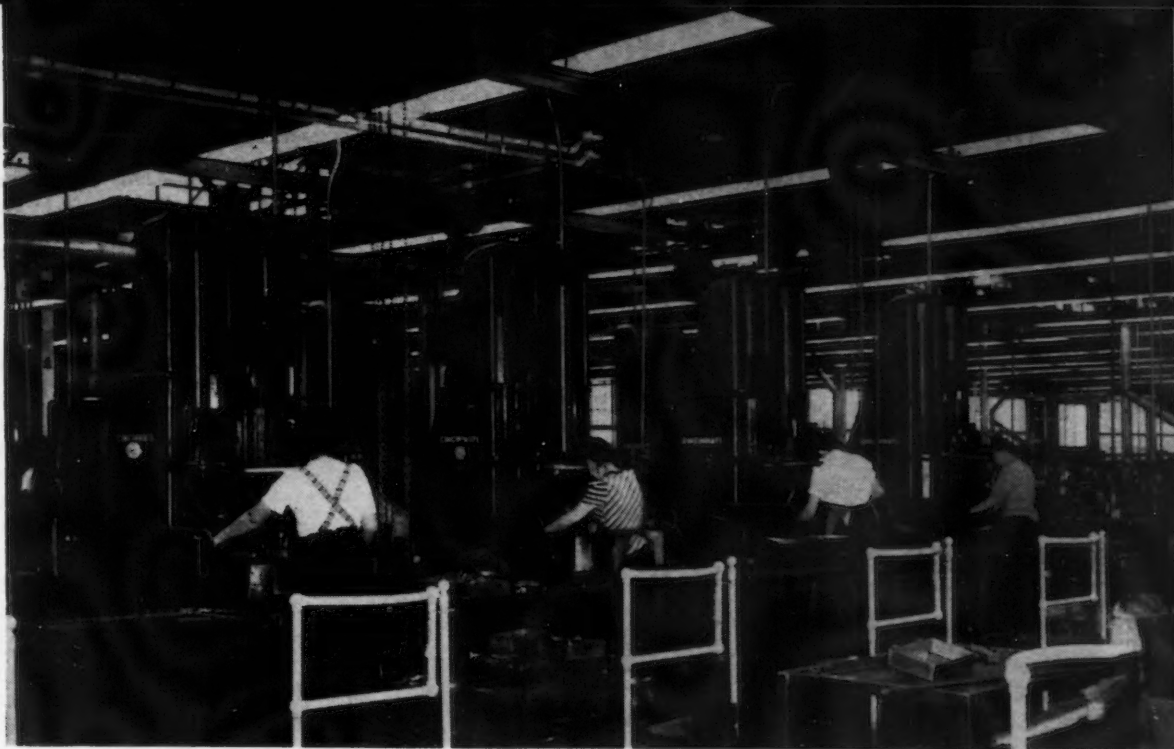
In order to appreciate the amount of saving derived in manpower, capital investment, and floor space, by adopting the broaching method in lieu of milling, where this method appeared to be practical, let us review the fundamental advantages of broaching over milling and later substantiate them by illustrating specific operations on several component parts for the semi-automatic rifle that were originally milled but later retooled for broaching.

(1) Surface broaching is a fast, efficient method of machining with cutting time usually shorter than in any other method producing the same results. One of the reasons for this is that while work is held stationary the multiplicity of cutting teeth pass across the workpiece, each removing only one chip at the rate of anywhere from 15 to 25 times that possible with the milling process, most generally used for the same type of work.

(2) In the broaching operation the time required to complete the cut does not vary much, as it does in milling, due to the variation in the length of the cut. For instance, if the length of cut were 2 in., and due to the change in the design of the component, the length of the cut were increased to 4 in., the time of machining on a milling machine will be practically doubled; however, if it were a broaching operation, the time required for this cut will be increased very slightly.

To substantiate this statement let us consider the factors that control the time required to perform the broaching operation, namely, the speed of ram travel and the length of stroke. Suppose in this hypothetical case the speed was 24 ft. per min. and the stroke was originally 36 in. for the 2 in. cut. Assuming that the material in this case remained the same and the length of cut only was doubled, the cutting speed will remain the same, but the stroke or length the ram travels will be increased. It is a known rule that the stroke of the machine is determined by several elements, some of which

BATTERY of small duplex broaching machines installed at Springfield Armory for machining parts for the Garand semi-automatic rifle. In this plant there are 82 duplex broaching machines, ranging in capacity from 1 to 20 ton, making this the largest broaching installation under one roof in the world.



remain constant, such as allowance of 1 in. for approach of inserts, or in other words, the space between the work and the first roughing tooth, and also 1 in. for overtravel and clearance of the fixture. There are two variable elements that enter into the length of stroke; first, length of cut, and second, length of broach inserts, which vary directly with amount of stock to be removed and pitch. Since the amount of stock to be removed remains the same, but the pitch increases with an increase of the product of chip thickness times length of cut, therefore total length of broach inserts will be longer in proportion to increase in pitch, which in our hypothetical case will be about 10 in. Adding to this the 2 in. increase in length of cut the total increase in stroke becomes 12 in., requiring a 48 in. stroke to broach the redesigned piece of work.

Translating this into the time element, the original cutting time would be $\frac{1}{8}$ min. and the new time, $\frac{1}{6}$ min. Using a duplex broaching machine the operator loads and unloads one fixture while a cut is being made on the other, and since in the majority of cases removing the work from the fixture, cleaning the locating points, and loading and clamping the work usually requires between 7 and 10 sec., it is obvious from the foregoing that doubling the length of cut practically does not affect the net production per hour obtainable from the broaching machine.

(3) Surface broaching permits machining several surfaces simultaneously, regardless of their relationship, as long as all elements of the broached surfaces remain parallel

with the axis of the broach holder and there are no obstructions in the path of the broached surfaces. In milling, the number of surfaces to be machined are limited due to complexity of cutters and undercuts, which often make compound cuts impossible. Simple layout usually indicates such a condition, that is, limitation in combining several milling cuts in one, forcing a process engineer to resolve the job into several milling cuts.

(4) Surface broaching permits machining components with much greater accuracy and better finish in one pass than does milling because roughing and semi-finish broach teeth remove the bulk of material and finishing teeth always remove only a light chip from the broached surfaces and consequently can maintain closer tolerances and finer finish.

(5) The chip problem in milling is a very serious matter, especially in the plants where an incentive compensation system is adopted. Although time is allowed in rate setting, the operator does not pay enough attention to chip disposal, resulting in overflow of coolant, clogging of clamping arrangements, chips getting into spring actuating jack supports, all of which are undesirable conditions and result in inaccurate and inefficient production as well as loss of time in clearing the fixture prior to reloading. In surface broaching, on the other hand, this problem practically does not exist. If properly designed, broach inserts, carry the chips past the work below the fixture and the coolant washes them off to the bottom of the tank. By making the fixtures so that there is no place for chips to lodge, cleaning time is not required.

(6) Surface broaching permits rapid expansion in production since the initial output of production per hour on broaching machines is very high. By the same token, broaching is limited to high production work.

(7) Broaching equipment occupies less floor space compared with milling machines producing the same number of parts, and performing the same cuts in fairly large daily output.

(8) The cost of perishable tools per unit produced in surface broaching is much lower due to the long life of the broaching tool. One of the reasons for this is low cutting speed, which hardly ever exceeds 30 ft. per min. on steel, which is less than half the speeds used in milling with high speed steel cutters. Since impact loads vary as the square of the velocity, the destructive effect of the tooth striking the work is much less with the broaching tool. According to experiments conducted years ago, it was shown that when the factor of heat is eliminated, the wear of a milling cutter varies directly as the number of impacts of the cutting tooth upon the work and that the thickness of the chip has no appreciable effect. Usually each tooth of a broaching tool strikes the work just once at the start of the cut, whereas the teeth of a milling cutter strike it many times before the cut is completed.

In conventional milling the chip starts from zero thickness, resulting in abrasive action which breaks down the cutting edge. The broaching tooth, on the other hand, always starts with a positive thickness of chip and does not suffer the same abrasive action. The longer broach tool life is also due to the better conductivity of the heat.

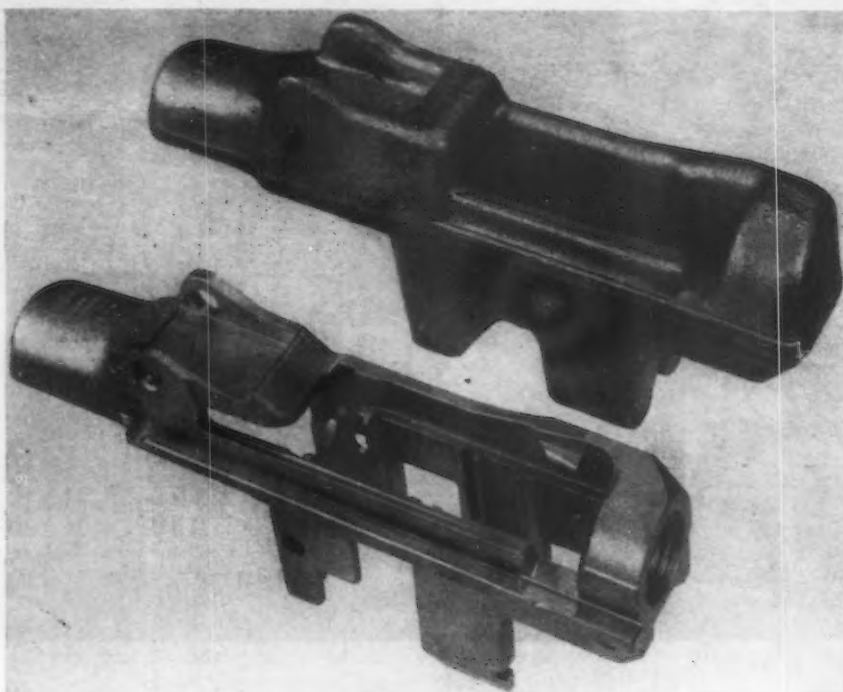


FIG. 1—Receiver of the Garand semi-automatic rifle M1 as a rough forging and as finish machined. It weighs over 7 lb. in the rough.

This can be explained by the stronger and heavier tooth shape of broach tool, which usually has a rake from 12 deg. to 20 deg. and a clearance angle from 2 deg. to 1 deg. contrary-wise, because the milling cutter tooth is actually forced into the work material, means that it has to be sharpened to a relatively high clearance angle from 6 deg. to 12 deg. and in addition has to be backed off to a small land. This weakens the cutting edge and materially reduces the heat conductivity.

(9) Broaching tools have a long life because the roughing teeth remove the metal in rather thick chips and finishing teeth do the finishing by taking light chips. The former can stand considerable punishment, while the latter, encountering no scale and removing very small amounts of stock, last long before requiring resharpening.

(10) Easier application of coolant is an important advantage of the broaching method. By centrifugal action, a milling cutter revolving between 50 and 100 ft. per min. throws coolant away from the point where it is most needed. On a broaching tool coolant can be directed exactly where it is wanted and actually flows between the tooth spaces under slight pressure, thereby helping to separate the chip from the tool and giving more satisfactory cooling.

In selecting the method of manufacture the cost per piece is always the predominant consideration; there-

fore the process engineer in his study carefully analyzes all factors which add to the final cost of the article. He knows the number of parts to be produced in a given period of time. If the choice is between milling and broaching, his next step is to estimate the number of milling machines and number of operators it would require to meet the production schedule and the cost of milling machines, fixtures, and cutting tools necessary to produce the required number of components in a given time. Similar estimates are made for the same production by broaching. Having this information it is a simple matter to write the equation:

$$A_m S + F_m + T_m + M_m K \geq A_b S + F_b + T_b + M_b K$$

where

A_m —Direct labor cost to produce required number of pieces by using milling machines

S —Overhead factor

F_m —Cost of all special milling fixtures, arbors, and other items required to set and operate milling machines for this particular article

T_m —Cost of all milling cutters necessary to produce required number of parts

M_m —Cost of all milling machines necessary to meet production schedule

K —Percentage factor, including amortization, taxes, depreciation and carrying charges to be ap-

plied against this particular article

A_b —Direct labor cost to produce required number of pieces by using broaching machines

F_b —Cost of all fixtures, broach holders and other items necessary to broach this article that cannot be used for other parts

T_b —Cost of all broach inserts necessary to produce required number of parts

M_b —Cost of broaching machine.

In manufacturing plants where cost of perishable tools is charged to overhead expense, the items T_m and T_b should be eliminated from the equation.

If the first part of the equation is greater than or equal to the second part it is evident that broaching is the correct method to adopt.

Before proceeding with estimating the cost of broaching vs. milling it is perhaps advisable to consult a field engineer who is well versed in broaching and its limitations, and who can render advice as to whether or not the design of parts make them suitable for broaching. One of the limiting factors is the amount of stock to be removed in one pass. Another is the condition that the work cannot have any obstruction in the plane of the surface to be broached, since the broaching tool is usually quite long and must pass completely across the work. In addition, the work must be strong enough to withstand the stresses set up by broaching.

In broaching, the rapid travel of cutting tools sets up stresses in greater amount than in milling. The ability of the part to stand these stresses, and thus allow broaching to be advantageous, depends not only on the design of the broached part and the material it is made of, but to a great extent on the design of the holding fixture (including proper shape of supporting blocks against the broaching pressure), the arrangement of the cutting tools and the design of the tools. So far as support of the work is concerned a proper fixture for almost any work can be designed by an experienced broaching engineer; it is essential, however, that the work be rigidly held in the fixture to avoid vibration and springing while the cut is being taken.

Broach Fixtures and Tools

In designing broaching fixtures it should be kept in mind that they should be quick-acting, since the cutting time is relatively short and the operator is required to unload and load the fixture during the cutting time on duplex type machines in order to obtain maximum utilization

of machine time. Clamps may be of the cam, screw, or weighted type, or they may be electrically, hydraulically, or pneumatically operated. Automatic mechanical fixtures, actuated by the movement of the swivel or retracting table, are also used. The main objective is always to achieve quick loading and unloading time with a minimum of physical effort by the operator, since he is likely to repeat this process several hundred times per hour, including the handling of parts which may weigh up to 10 lb. each.

There is no fast rule for design and arrangement of broaching tools. Each case must be studied as a problem by itself. However, pitch and chip per tooth are governed by the length of the work, amount of stock to be removed, and the finish desired. The principle of shear cutting may be used on surface broaches as it gives a better finish and eliminates vibration. At Springfield Armory shear angles on some surface broaches as high as 30 deg. are used. In broaching forgings and castings where there are usually wide fluctuations in the amount of stock removal, the first tooth of the broach must bear the brunt of removing the entire excess; therefore as a rule the first tooth, called the bumper tooth, is usually made much thicker and stronger. Regardless of the length of the broach insert required to remove a given amount of metal in one pass, the rule has been adopted not to make inserts longer than 12 in., even if it would require making a broach insert in four or five pieces, each following the other. This rule was adopted for several reasons, to wit:

(1) It is more economical for the manufacturer of broach inserts to handle small pieces as it would be less expensive to lose a small

broach insert than a large one. Difficulty might be encountered in heat treatment or the broach insert might be lost in grinding.

(2) It is less expensive for users of broach inserts to replace a small section than one very long solid broach insert. The loss might be due to breakage of a few teeth or mistakes made in resharp-ening or setting. In addition, in many cases it is possible to utilize broach inserts more efficiently by moving finishing inserts in place of the preceding one when it cannot be used any more as a finishing broach insert. This stepping down is considerably more of an economical gain when the taper gib adjustment is not sufficient.

Since each broaching machine and broach insert manufacturer has developed its own formula for calculating the pull capacity of the machine required for each individual job and has also developed empirical tables or slide rules for calculating "safe chip room," tooth depth and shape, pitch, face angle, land and back of angle, the discussion on broach insert design will be limited to the following:

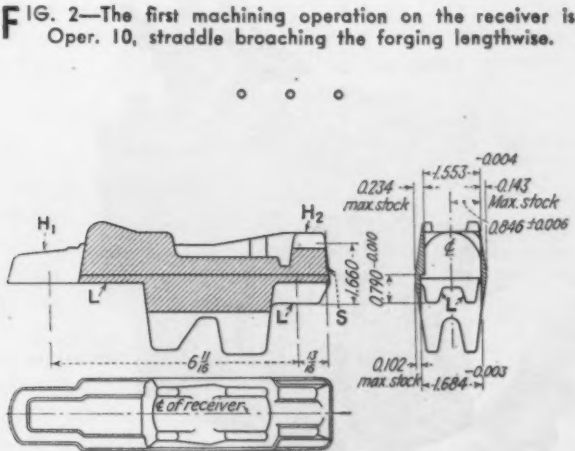
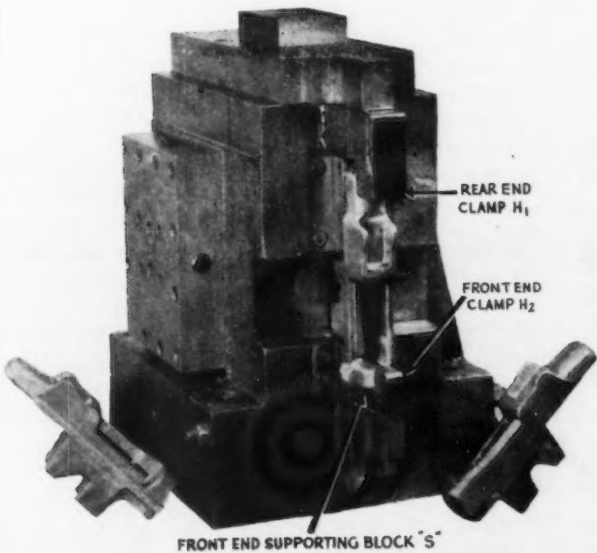
The cross-sectional area of the chip is the product of the length of cut or chip times the thickness of the chip before being cut, or amount of material removed by one tooth. When a steel chip is rolled up into spiral form it usually occupies about 4½ times the area of its actual cross-sectional area. In order to provide sufficient chip space the gullet must be correspondingly larger to contain that chip without packing. The Cincinnati Milling Machine Co. has set down the relationship that the area of the gullet should be 10 times the cross-sectional area of the chip when

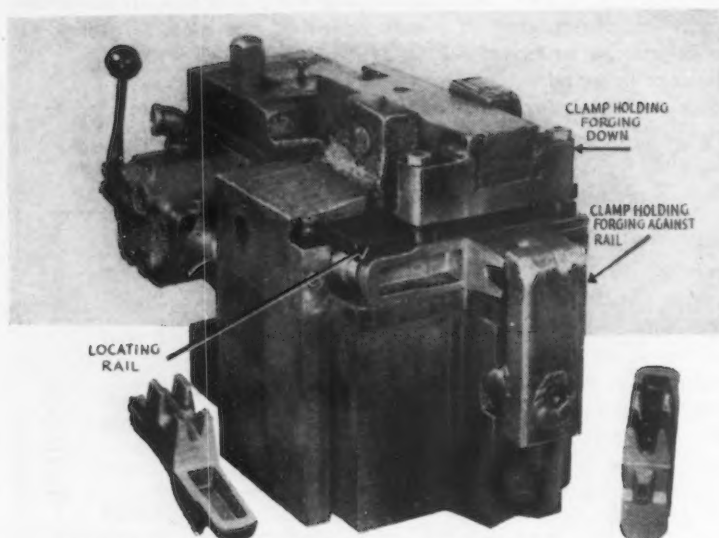
broaching steel and has prepared the data on pitch and chip thickness relationship shown below:

Pitch for Steel In.	Chip Thickness Times Length In.
1/4.....	0.0014
5/16.....	0.0022
3/8.....	0.0031
7/16.....	0.0042
1/2.....	0.0055
9/16.....	0.007
5/8.....	0.0086
11/16.....	0.0104
3/4.....	0.0124
13/16.....	0.0145
7/8.....	0.0168
15/16.....	0.0193
1.....	0.022
1 1/4.....	0.033
1 1/2.....	0.0495
1 3/4.....	0.0673
2.....	0.088

For other details of broach insert tooth design the reader is referred to the chapter on broach insert design in the book entitled "Broaches and Broaching," published by Broaching Tool Institute.

In broaching rifle parts at Springfield Armory all except one component come to the broaching machines as a forging, trimmed, scale removed and heat treated for good machinability. Since each component part is subject to other machining operations, such as milling, profiling, drilling, reaming, thread milling, it was necessary





to select the range of hardness that would give satisfactory results in broaching and would not be detrimental to the tool life in other machining operations.

From experience it was found that the best result obtainable by broaching was to have the work heat treated to have a hardness reading of 250-265 Brinell. This hardness is too high for other operations, and it was found that a hardness range between 180 and 200 Brinell is most satisfactory for all machining operations. Every lot of forgings is inspected as to the size and hardness before it is released for machining. Inspection with gages as to the size is absolutely necessary because forgings have caused considerable trouble due to

non-uniformity beyond the allowable limits.

In order to appreciate what saving was obtained by Springfield Armory in adopting broaching methods wherever this method was practical let us review several component parts of the Garand rifle. It will be necessary to review the operations on typical parts and compare the results with similar data assuming milling machines were used.

Operations on Receiver

The largest and most difficult part to manufacture is the receiver, shown in Fig. 1 in the upper view as a forging and in the lower view as a finished component which requires over 90 machining operations. The

first eight cuts are broaching operations and work is held in hydraulically operated fixtures. This feature is very important since the forging weighs over 7 lb. and is handled from 180 to 700 times in one hour on some machines where four different cuts are made. It was necessary therefore to reduce physical fatigue to a minimum by relieving the operator entirely of effort to clamp the component. This change from the original fixture design with hand operated, mechanical clamping arrangement to hydraulically operated clamping permitted increasing production approximately 25 per cent in some cases. Every fixture is equipped with micro-switches and electrical contacts interlocked with a main operating cir-

cuit which prevents the operation of the machine if the clamps are open or the forging is not properly located.

The first machining operation on the receiver is straddle broaching, illustrated in Fig. 2, and on the operation sheet is known as "Operation 10-straddle broach lengthwise." The forging is located on two springs actuating taper plugs which enter the front cavity at B-B and rear cavity at A-A. This permits proper distribution of stock removal. Forging is placed into a fixture against positive stop at point marked S and held with two hydraulically operated clamps applied at points marked H_1 and H_2 .

by 20 per cent, and gives a production of at least 92 pieces per hr.

The right side table is equipped with a double type fixture holding two components while the ram with two mounted broach holders pass the work, taking two cuts, or passes, illustrated in Fig. 3. The first pass is known as "Operation 12A, rough broach crosswise front and rear of magazine legs," after which the forging is removed and placed into the next fixture and second pass is made. This is known as "Operation 12B, finish broach underside and front and rear, or magazine legs and front end." (See lower sketch, Fig. 3.)

is no dimension required to be held to less than a limit of 0.004 in.

Broaching Procedure

Since these two cuts are made on the down stroke of the right hand side ram on the same 15-ton duplex broaching machine at the same speed, the total standard time per piece is the same and the minimum production per hour is also the same, that is 92 pieces. The broaching procedure and handling of the forgings on this machine for the three operations is as follows: Assuming that all fixtures are loaded, the operator pushes the starting button, initiating the

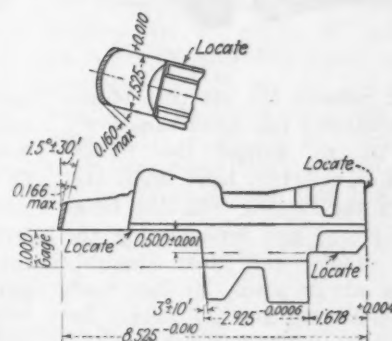
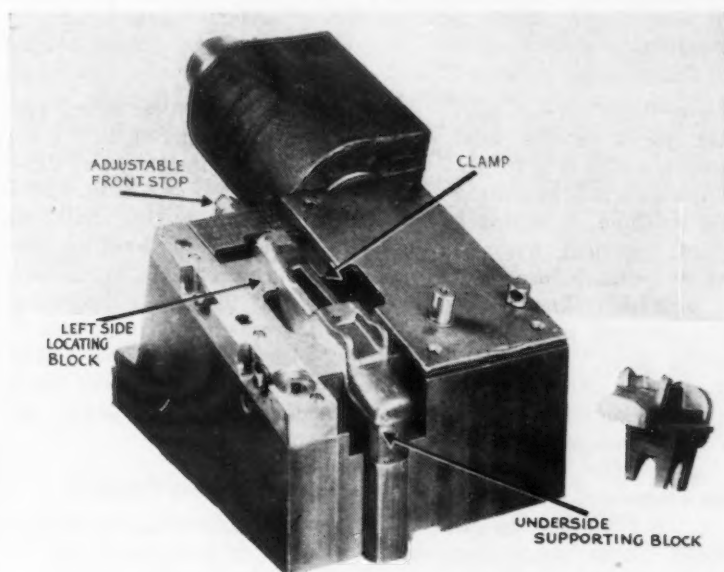


FIG. 5—Oper. 116 consists of form broaching the rear end of the receiver.

o o o

on front and rear of forging, forcing it against a hardened block in the fixture with surfaces indicated with letter L. The material is WD 8620 steel, with stock to remove on the right side of 0.234 in. maximum and on the left side, 0.143 in. The accuracy required is 0.003-0.004 in. with a fine grade of machine finish. Since the roughing broaches start to cut on narrow trimmed surfaces it was advisable to remove a heavy chip of 0.007 in. per tooth at the beginning of the cut, and gradually decrease the chip per tooth as the cut widens so that the finishing teeth remove a chip only 0.001-0.0005 in. thick.

This operation is performed on the left ram of a 15-ton duplex surface broaching machine, having a 66 in. stroke, at a forward and return speed of 21.6 ft. per min. Total standard time per piece, including personal allowance, inspection, cleaning up, punching time card, and for adjustment of the fixture and broach inserts is 39 sec., which is usually reduced by the operator on piecework

The forging is located in both fixtures identically, that is, a part rests on its left side in the fixture located lengthwise from the cavity marked "stop," with the in-and-out location controlled by stop against the rail marked L. Two hydraulically operated clamps hold the forging in the fixture, one holding the component down by applying pressure on the surface indicated by letter H_1 and another clamp keeping the forging against the locating rail by applying pressure at point H_2 .

Due to the draft in the forging the amount of stock to be removed runs as high as 0.201 in.; however, since the broach inserts in those cases begin to cut the apex or narrow point of the draft, the chip load per tooth starts out at 0.006 in. and is gradually reduced to 0.002 in. as the width of cut begins to increase leaving stock amounting to only 0.001-0.0005 in. per tooth to be removed with the finishing teeth. Allowable tolerances on this operation are quite liberal and there

cycle. First, the left hand table brings the fixture with forging into broaching position and the left ram begins its stroke, moving down until the finishing broach inserts pass the work. The ram remains in the down position while the left ram table automatically swivels back. Then the operator presses the starting button again, but this time the right ram table brings the double fixture into broaching position and the right hand ram carrying broach inserts begins to descend, taking two cuts as described above. At the same time the left hand ram is ascending and the operator removes the broached forging from the left hand fixture and replaces it with a new one.

The operation of the machine stops after each stroke, which allows the operator sufficient time to unload and load the fixtures in safety. Since there is an intermediate grinding operation after the first broaching cut in the left hand fixture there is a supply of ground forgings on hand for the second broaching. After the

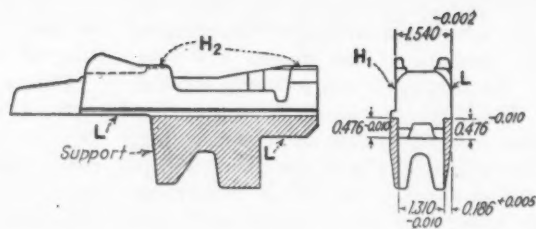
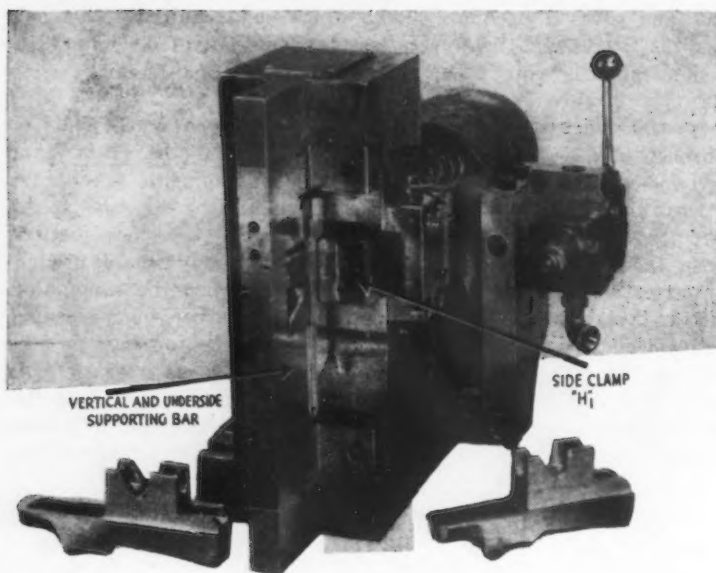


FIG. 6—On the same table on which the fixture shown in Fig. 5 is mounted is this second fixture for performing Oper. 13A, rough broaching both sides of the magazine legs.

operator presses the starting button which sends the left hand ram down, he begins to unload the fixture mounted on the right hand table, first removing the forging with the finish cut performed and transferring the forging that was just roughly broached into its place. He then loads a ground forging into the fixture for the roughing cut. By repeating this procedure with each stroke of the machine, one forging with three broaching operations performed is produced with each cycle of the machine. A cycle comprises one ram stroke down and return. The forgings are brought up to the operator in a vertical conveyor and taken down in it for grinding after the first broaching cut is made on the left hand fixture. Following grinding they are brought back up in the same manner.

After the third broaching is completed the forgings are placed on an

overhead conveyor that carries partially broached parts to the next broaching machine, which is a 10-ton, 66 in. stroke duplex surface broaching machine. This machine is equipped with a pair of identical fixtures, broach holders, and broach inserts to perform the operation known as "Operation 11A, broach right side, rail and locating pads," and illustrated in Fig. 4. The component is located in the fixture on the left side and supported lengthwise on the front end marked "stop." One hook type clamp holds the component with pressure applied at the point marked H_1 against hardened blocks contacting underside surfaces marked L and the second clamp is applied to the right side of H_1 , forcing the part against the left side in the fixture. The maximum stock to be removed from the top of the forging for locating pads is 0.102 in. and only 0.015 in. from the right side. Since the broaches

immediately begin cutting broad surfaces, the chip load per tooth for the roughing broaches starts out at 0.002 in., gradually decreasing to a 0.0005 in. chip removed by the finishing broaches in order to maintain accuracy within 0.002 in. Since each ram performs the same operation with each stroke, one component is broached with each stroke and hourly production, with all allowances taken into consideration, is at least 190 pieces.

Duplex Machines Favored

The next four broaching operations are performed on a single 15-ton, 66 in. stroke duplex surface broaching machine. Each ram is equipped with two fixtures each holding one component, so that at each stroke of a ram two cuts are made. On the left hand table are mounted two fixtures. The first fixture holds the component while operation known as "Operation

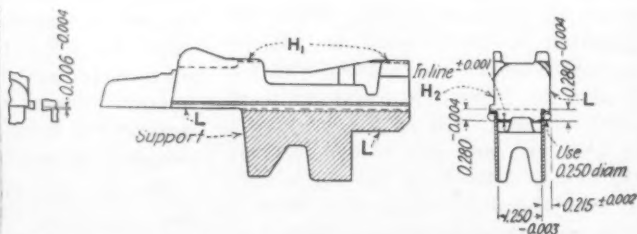
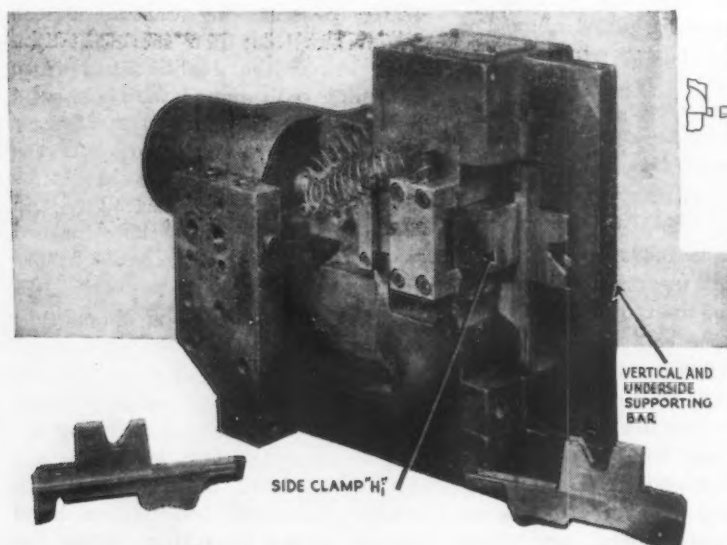


FIG. 7—The fixture for performing Oper. 13B shown and for Oper. 13C (Fig. 8) are both mounted on the right hand table of the same machine carrying the fixtures shown in Figs. 5 and 6 on the left-hand table. Oper. 13B involves finish broaching the sides of the magazine legs.

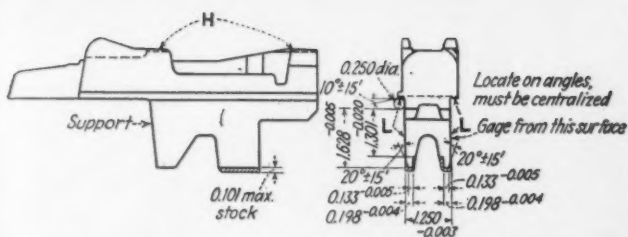
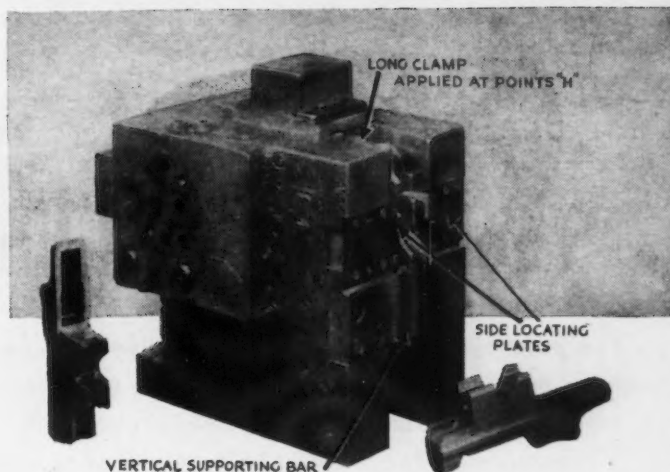


FIG. 8—Oper. 13C consists of finish broaching the ends of the magazine legs of the receiver.



116, form broach rear end" is being performed, as illustrated in Fig. 5. The component is supported on the front end and undersides and is clamped against the left side. The maximum stock to be removed is 0.166 in. with chip load per tooth of 0.007 in. on roughing broaches, gradually decreasing so that finish-

ing teeth remove only a 0.001 in. chip per tooth. The second fixture holds component while operation known as "Operation 13A, rough broach both sides of magazine legs" as shown in Fig. 6, is performed. The component is supported on the rear end of its legs as indicated by "support" and located on undersides and left side,

as marked by letter L. Two clamps are applied to hold the component rigidly, one on right, as indicated by letter H, and the other on two spots marked H, on the top of the receiver. The maximum stock to be removed is 0.191 in. and since the roughing teeth strike a fairly wide
(CONTINUED ON PAGE 156)

TABLE I
Comparative Broaching vs. Milling Operations of Receiver of M1 Rifle

BROACHING					MILLING				
Description of Operation	Machine Used	Net Pieces Per Hr.	Number Machines Required to Produce 1000 Pieces Per 8 Hr.	Number Operators Required to Produce 1000 Pieces Per 8 Hr.	Description of Operation	Machine Used	Net Pieces Per Hr.	Number Machines Required to Produce 1000 Pieces Per 8 Hr.	Number Operators Required to Produce 1000 Pieces Per 8 Hr.
Op. 10—Straddle broach lengthwise	15-66 in. Foot-Burt duplex surface broaching machine	92			Op. 1—Straddle mill sides	4-36 in. Cincinnati Hydromatic miller	18	8	3
Op. 12A—Rough broach crosswise front and rear of magazine legs	Same	92	2	2	Op. 5—Mill magazine legs crosswise	4-36 in. Cincinnati Hydromatic miller	26	6	2
Op. 12B—Finish broach underside and front and rear of magazine legs and front end	Same	92			Op. 108—Mill underside surface rear end	No. 12 B&S miller	45	3	
					Op. 107—Mill underside surface front end	No. 12 B&S miller	45	3	3
Op. 11A—Broach right side, rail, and locating pads	10-66 in. Foot-Burt duplex surface broaching machine	190	1	1	Op. 2—Mill rail and step on right side	3-24 in. Cincinnati Hydromatic	35	4	2
					Op. 3A—Mill locating pads on top	No. 12 B&S miller	35	4	2
Op. 116—Form broach rear end	15 ton, 66 in. Foot-Burt duplex surface broaching machine	80			Op. 118—Form mill rear end	No. 1224 Milwaukee miller	82	2	1
Op. 13A—Rough broach sides of magazine legs	Same	80			Op. 6—Rough straddle mill sides lengthwise and ends of magazine legs	No. 3-24 in. Cincinnati Hydromatic	36	4	2
Op. 13B—Finish broach sides of magazine legs	Same	80	2	2	Op. 7—Finish straddle mill sides lengthwise and ends of magazine legs	No. 12 B&S miller	18	8	3
Op. 13C—Finish broach ends of magazine legs		80							

Tool Steel Welding

... The potentialities of tool steel welding first became evident when emergency repairs to tools were made to meet war schedules. Data here shows how closely the characteristics of the weld deposit conform to those of all basic types of tool steel.

UNDER the stress and strain of war production schedules, many shops turned in desperation to welding to make emergency repairs to broken tools and dies, and found that welding could be done successfully on hardened tool steels. New applications, new highly developed electrodes, new wrinkles and short cuts, all in accordance with a few basic principles, will make this process one that will have tremendous possibilities in the tool room both for repairing tools and dies and for the composite fabrication of new ones.

Tool steel welding as a specialized branch of arc welding is a process that will be increasingly important to industry in postwar retooling programs. Just as a mild steel welding electrode deposits mild steel weld metal, so a tool steel welding electrode will deposit tool steel weld metal of any one of several basic types, such as hot work tool steel, oil hardening tool steel, high speed tool steel, etc. The weld deposit will have the characteristics that are typical of each type and may be tempered, drawn, annealed or rehardened, the same as any tool steel in its classification.

A distinction should be made here between tool steels and hard facing materials. There is a tendency to re-

gard them as being the same since there is some overlapping in a few applications. The fundamental difference is, however, that hard facing materials are not usually heat treatable but rely on inherent and unchangeable hardness whereas tool steels may be annealed, rehardened and tempered to any desired combination of hardness and toughness. In general, the fields of application are widely separated but the uses of hard facing alloys in tool tipping have led to a little confusion of these two groups of materials.

In order to take full advantage of the arc welding process in the construction and repair of high speed steel tools and dies, one should have all the information that is available on both the welding electrode and the steel used. Steel suppliers have an abundance of data on their tool and die materials, and these should be consulted and compared with similar data on the welding electrode. A surprisingly close match of heat treating and working conditions between weld and tool may be made if procedures indicated by this comparison method are followed.

It is both feasible and possible to weld on hardened tool and die materials without losing hardness in the tool and without leaving an embrit-

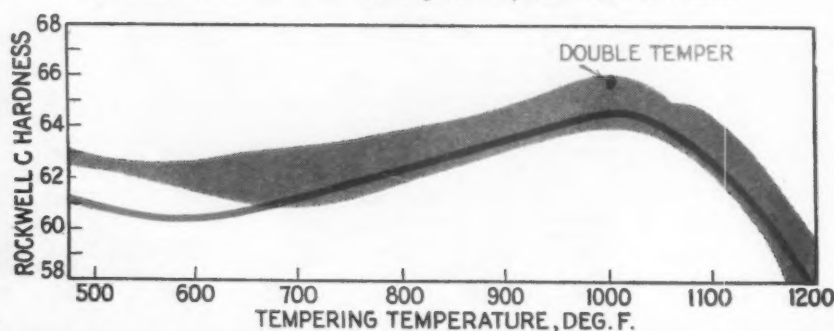
tle zone of fusion between weld and base material, if recently developed electrodes of the proper type are used. Preheating the tool or die before welding is very essential in eliminating this hard fusion area under the weld and also in retarding the rapid quench of the weld deposit from the arc welding heat. The weld itself is air hardened from the welding heat and preheating tends to slow the cooling through the critical range.

Types of Steel Reviewed

High Speed Steel: The accompanying tempering curve (Fig. 1) shows that the high speed steel weld deposit has the secondary hardness that is typical of all high speed steels, and would indicate that hardening as a result of arc welding is similar to conventional hardening. Tempering after welding is necessary and should be done according to this curve of the weld deposit to meet whatever working condition is desired. Double tempering of the weld deposit may be used to gain about two points of hardness over a single temper at the same temperature and holding time, and follows recent theories on martempering of high speed steels. By way of comparison, notice that the hardness as shown in Fig. 2 is the same as that shown in Fig. 3, yet Fig. 2 was double tempered for a total of 1 hr. ($\frac{1}{2}$ plus $\frac{1}{2}$) whereas Fig. 3 was single tempered for 2 hr. The hardnesses of 66 Rockwell C would indicate that the weld deposits of both had been almost completely de-austenitized by a somewhat different handling.

How a high speed tool would look after having been repaired by arc welding is shown in Fig. 3. The base may be considered the tool, having a hardness of 64.9 Rockwell C before welding. After preheating to 500 deg. F. the tool was then welded and tempered for 2 hr. at 1025 deg. F.

FIG. 1—The tempering curves of all typical high speed steels lie within the shaded area. The red curve is the weld deposit tempered from "as welded."



The weld now shows a hardness of 66.2 Rockwell C while the body of the tool has softened slightly to 64.3 Rockwell C. This is an ideal condition for a welded tool. The weld shows an acicular martensite structure with most carbides in solution. The fusion line blends well and has very few eutectic areas. The base metal is a normal acicular martensite structure with carbides.

From a comparison of these photomicrographs we can reasonably conclude that the cutting and wearing qualities of the weld will be better than those of the base material of the same analysis because of the higher solution of carbides in the weld. This probably explains the consistently longer life of welded tools as against the conventionally hardened forged tools that are oil quenched.

The ability of the weld deposit to retain hardness at elevated temperatures is shown in Table I.

The air hardening steels are often used for cold cutting dies, and also for applications where abrasive wear is to be met. Many burnishing tools are made of these types of steels, which range from 5 per cent Cr—1.00 C to 12 per cent Cr—2.5 C. Wear resistance (and also fatigueability) seems to be a function of chromium—the high chrome type having more wear resistance (but also will fatigue easier) than the lower chrome type. The dimensional change of these types during hardening is extremely low being even less than the non-shrink oil hardening steels. While these types are one kind of high speed steel, they should not be used where much heat is encountered because the combination of low thermal

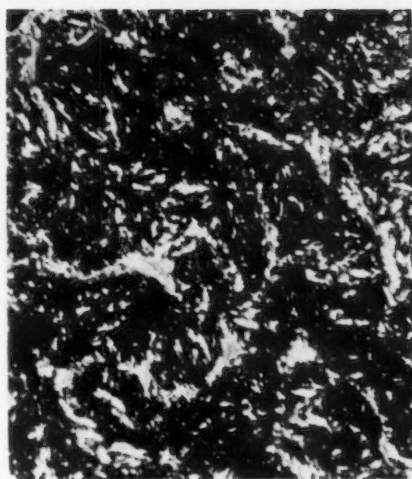


FIG. 2—Photomicrograph of high speed steel weld showing the value of double tempering as against single tempering for twice the time as in the case of Fig. 3. Magnification 1000x.



FIG. 3—Photomicrograph of weld deposit of high speed steel electrode on base of a typical high speed steel, tempered to 1000 deg. F. At left is the weld; center, fusion line and right, base metal. Magnification 1000x.

conductivity and high coefficient of expansion could produce an upset condition in a hot working tool of this material.

The air hardening steels can be readily welded if care is used to pre-heat very slowly and uniformly and if fatigue checks and cracks are completely removed before welding.

The tempering curve, Fig. 4, shows that the weld deposit has the secondary hardness typical of the type and it is advisable that the weld material should not be tempered between 600 and 800 deg. F.

This electrode may be used for other applications involving friction—such as lathe centers, centerless grinder rests, wear pads, deep drawing dies, etc., and is especially useful for making up composite dies.

Oil Hardening Steels: A great many oil hardening steels lend themselves to repair by welding with the non-shrink electrode. The weld deposit of this electrode is typically non-shrink, but may be used to repair other oil hardening alloys since the performance as expressed by the tempering curve, Fig. 5, is very nearly the same. Most of the tool alloys in this group have a very low draw range and in preheating before welding care must be used to avoid heating over the low temperature of the draw range (200-400 deg. F.).

Welding should be done slowly on these steels and stopped whenever the overall temperature of the work has reached the maximum draw temperature (400 deg.). A pyrometer should be used frequently, especially when the repair is large.

This non-shrink type of oil hardening steel is widely used in the die

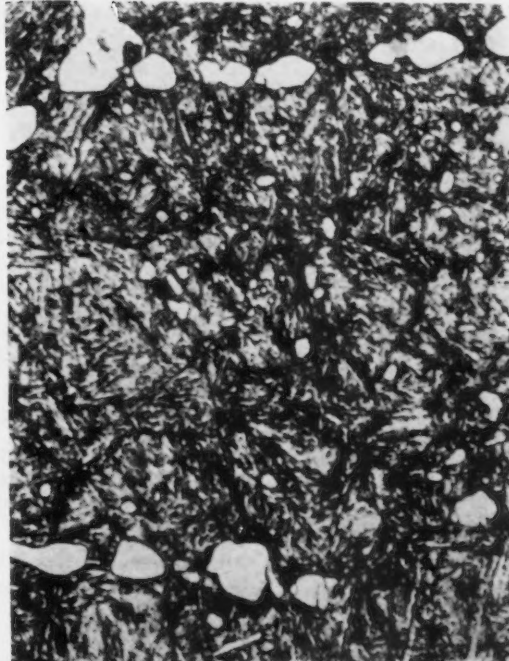


TABLE I
Hot Hardness of Arcaloy High Speed Steel Weld Deposit As Welded
Double Tempered at 1000 Deg. F.

Temperature of Test	Hardness—Rockwell C				
	Cold Before Test	After Specimen Reached Temp.	After 30 Min. at Temp.	After 60 Min. at Temp.	Cold After Test
1000 deg. F.	65.8	56.3	55.2	54.8	64.6
1100 deg. F.	64.2	52.3	54.9	54.9	63.6
1200 deg. F.	63.8	48.9	44.3	40.6	45.9

TABLE II
Hot Hardness of Arcaloy Hot Work Weld Deposit As Welded—
Not Tempered

Temperature of Test	Hardness—Rockwell C				
	Cold Before Test	After Specimen Reached Temp.	After 30 Min. at Temp.	After 60 Min. at Temp.	Cold After Test
1000 deg. F.	57.2	46.7	47.2	47.6	55.8
1200 deg. F.	55.9	24.7	16.1	17.2	42.7

TABLE III
Selection of Materials for Composite Dies

Tool or Die Function	Type of Tool Steel Electrodes	Base Material
Cold cutting (light duty) (heavy duty 1/4 - 1 in.)	Water hardening	SAE 1040-1050- 1335
	Oil hardening	
	High speed	SAE 1050-3100- 4100 series
	Oil hardening-400 deg. F. temper Air hardening-900 deg. F. temper	
Hot cutting	Work hardening (some)	SAE 3100-4100 series
	Hot work	
	High speed	
Hot forming	Hot work	SAE 1050
Hot heading	Work hardening	SAE 4150
Hot extruding		SAE 3150
Hot forging		
Cold forming and heading	Air hardening-900 deg. F. temper	SAE 3100-4100
Cold forging	Work hardening (non-magnetic)	
Abrasive wear	Water hardening	SAE 1050
	Air hardening-400 deg. F. temper	
	High speed-1050 deg. F. temper	
	Oil hardening	
Punching	Air hardening: Punch 900 deg. F. temper Die 440 deg. F. temper	SAE 1050
		SAE 4150
Shearing (see cutting)	Water hardening (light cutting)	SAE 1050
	Oil hardening-400 deg. F. temper	
	Air hardening-900 deg. F. temper	
	Air hardening-400 deg. F. temper	
Drawing	Work hardening (non-magnetic)	SAE 1050-4150
Cold extruding	High speed	
High speed cutting	High speed	SAE 1050

shop because of its low movement in hardening and its fine cold cutting qualities. Many low alloy tap steels may be repaired with this electrode with an improvement in tool performance and a very close match of heat treatment.

The photomicrographs show a little finer tempered structure in the weld deposit than in the base metal, which is the ideal condition for a welded tool or die.

Though it is not desired to show a picture of what not to do, in an effort to stress the importance of keeping the overall heat of a repaired unit under the draw temperature, there is included here a photomicrograph of a weld made without regard to keeping the heat down. Fig. 6 shows that the weld deposit, while thoroughly tempered, has a typical coarse cast structure, and in effect has not been quenched fast enough. This is due to an excess heat condition during welding. The hardness is much too low in both weld and base. In a welded die, this would show up as a soft spot around the repaired area. Naturally this is to be avoided, and can be if small electrodes are used and welding interrupted as the die approaches its maximum draw temperature. A temperature of 700 deg. F. has little effect.

Work Hardening Steels: The weld deposit made by the work hardening type electrode is not a tool steel but fills a need in repairing or fabricating many dies. The deposit is austenitic and can be used to advantage on drawing dies where pickup is to be avoided. This material is 20 Rockwell C as welded, and will increase with cold working to a maximum of 46-50 Rockwell C. It will withstand severe impact and can be used on cold or hot heading dies. Being unaffected by heat, it can be used on many hot work applications where lower hardnesses are suitable. If the deposit is cold worked to the upper machinability range, it will harden further in service, without possibility of deformation. If used to repair washed out areas, the same cautions against overheating during preheating and welding should be observed to avoid mishandling the base material. Once this material is hardened, any reworking must be done by grinding. It cannot be annealed within the normal range of other steels and, of course, cannot be tempered.

Water Hardening Steels: There are a good many types of water hardening alloys used in making tools and dies that can be repaired and rework-

ed by welding. While the analyses of these types may vary according to their working properties, their heat treatments are very nearly the same. These steels are usually shallow hardening and are often flame or case hardened to provide a hard skin over the tough core. The weld deposit made by the water hardening electrode can be heat treated and otherwise processed the same as almost all of these water hardening tool alloys. In welding these steels care must be taken not to overheat unless it is the deliberate intention to draw the hardness. The tempering curve for water hardened stool steels is shown in Fig. 7.

Hot Work Die Steels: Where toughness at elevated temperature is the desirable quality plus the ability to resist heat checking hot work die steels, are often used, usually at low hardnesses. Minor variations of typical hot work analyses are used for shock tools such as chisels and these steels also may be repaired or fabricated with the hot work electrode. Typical applications for hot work steels are hot extrusion dies, hot trimmers, hot punch and die sets and hot shears. These hot work steels are easy to repair by welding because the hazard of overheating the draw temperature is almost nil. The usual practice is to temper these steels at the temperature of operation before returning the die to service. Composite dies may be built with weld deposit of the hot work electrode on

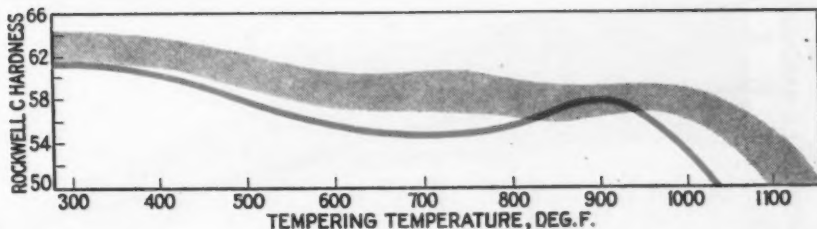


FIG. 4—The tempering curves of the air hardening die steels and the high carbon, high chrome die steels all lie within the shaded area. The red curve is the weld deposit tempered from "as welded".

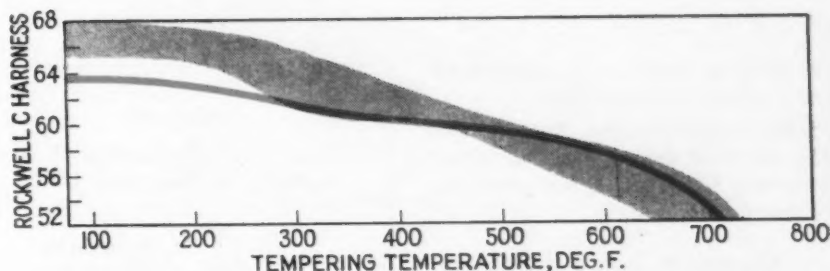


FIG. 5—The tempering curves of the following steels lie within the shaded area: Oil hardening, non-shrink, all types including high or low manganese, chromium or tungsten, low-alloy tap steels and some chromium-vanadium steels. The red curve is the weld deposit from "as welded".

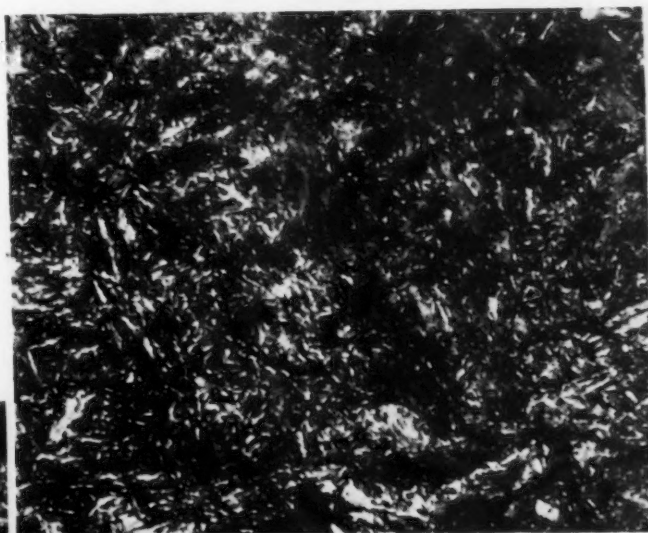
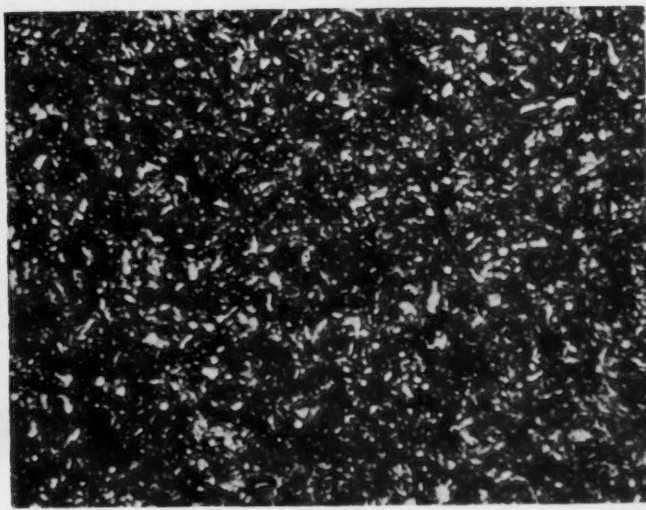
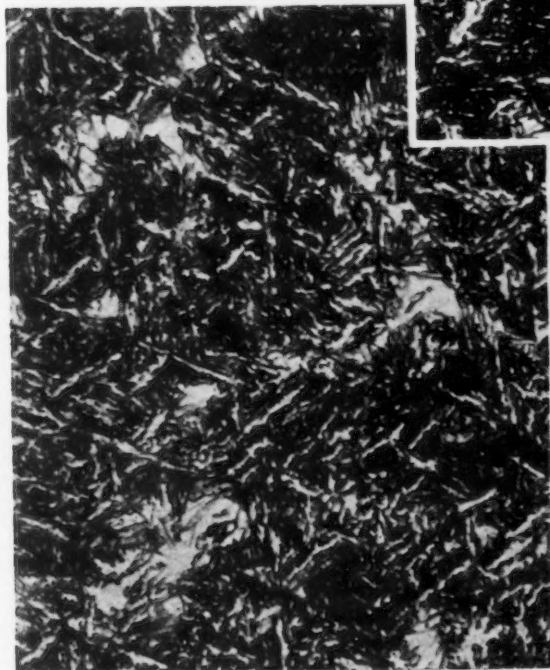


FIG. 6—Photomicrograph of oil hardening steel weld which has a typical coarse cast as a result of not being quenched fast enough. At left is the weld; center, fusion line, and right, base metal. Magnification 1000x.



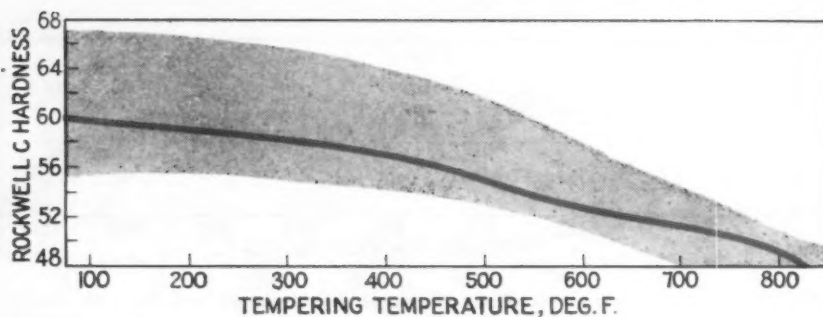


FIG. 7—The tempering curves of all water hardening tool steels, including finishing steels, tool alloys and chisel steels, lie within the shaded area. The red curve is weld deposit tempered from "as welded."

the working areas, using a base material of SAE 3140 or 4140.

The tempering curve, Fig. 8, shows that the weld deposit has the typical secondary hardness of hot work and tungsten chisel steels.

Composite Tools and Dies

In making up tools and dies compositely a principle widely accepted today under the terms *case hardened* and *tough cored* is applied. A difference in hardness between working surface and backup is used to minimize breakage, to put hardness where it is needed, backing up this hardness with toughness. Essentially, this is just how a composite tool may be described.

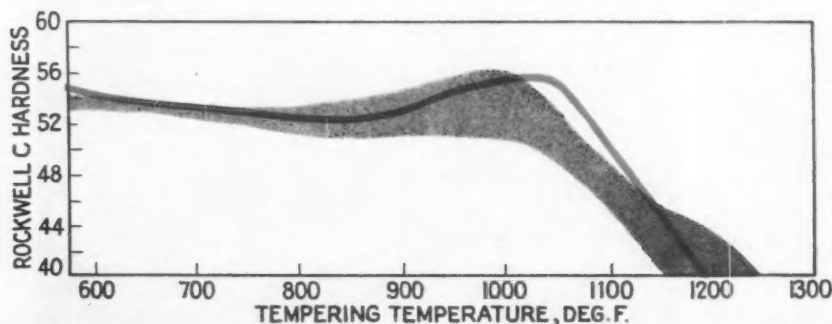
Many dies and tools have been made in the past by shaping the working area out of a hardened steel and then bolting this to a dissimilar base material, or by inserting the wearing or working pieces into a softer or tougher matrix. This method involves shaping, hardening, tempering and fastening.

A much easier and more direct method and one giving the same operating effect is to make the hard working areas of tool steel weld metal. This eliminates hardening and fastening operations because the weld is air hardening from the arc heat and is a permanent part of the die or tool. This welded working area can

TABLE IV
Base Metal Preparation For
Composite Tools and Dies

Material	Draw Temp. Deg. F.	Hardness Rc (Quench from 1550 deg. F.)	
		Oil	Water
SAE 1040	800	21	25
	900	20	22
	1000	19	19
	1100	17	17
SAE 1095	800	39	41
	900	38	37
	1000	37	35
	1100	35	34
SAE 1335	800	36	..
	900	33	..
	1000	29	..
	1100	25	..
SAE 3145	800	39	..
	900	34	..
	1000	30	..
	1100	27	..
SAE 4130	800	37	44
	900	36	41
	1000	33	37
	1100	29	31
SAE 4140	800	46	..
	900	41	..
	1000	37	..
	1100	35	..

FIG. 8—Tempering curves of all typical hot work steels and chisel steels lie within the shaded area. The red curve is weld deposit tempered from "as welded".



be shaped by grinding, and its hardness and toughness can be controlled by tempering to meet a variance in working conditions.

There are two main considerations in the selection of materials for composite tools or dies: the characteristics that are wanted on the working area and the characteristics of the base material in relation to the operating condition.

In selecting the type of tool steel electrode to use in depositing the working area the range of uses of the corresponding type of die stock can be used as a guide. For cold cutting, for example, an oil hardening electrode of the non-shrink type is generally used. To meet different severities of cold cutting conditions, hardness and toughness of the welded area can be controlled by tempering at the same temperature as for the die stock. With the six types of tool steel welding electrodes to be used in depositing working edges or area it is possible to duplicate functionally by means of composite construction, any tool or die, including any of multi-purpose character.

The selection of the proper base material is simple, the main purpose being to back up the working areas under the actual operating conditions of the die. If pressures are high, the base must not compress or mushroom from under the weld. If operating temperatures are high, the base must be selected for toughness at the operating temperature in order to properly back up the weld. Thus, the factors to be considered in selecting base materials are pressure, heat and impact all in relation to each other.

In Tables III and IV are the suggested "match-ups" of weld material and base material for a general variety of composite tools and dies. These tables are suggested mainly to discourage the practice of picking out just any likely shape from the scrap pile for use as a die base without regard for pertinent operating conditions. A properly fabricated composite die has several important advantages over the solid block die such as absence of splitting, easy reworking, no need for heat treating and longer runs. The study of individual working conditions of the die or tool may make it necessary to deviate somewhat from this table. Consult the tempering curves of each electrode so that tempering may be done to best suit the working condition of the die or tool.

Combining Stretch and Pressure Contour Forming

SHIPS and planes, buses and trailers, locomotives and railroad cars, searchlights and store fixtures, furniture and all manner of metal fabrication are built up in contoured forms made from sections like I-beams and channels. These shapes were originally designed to resist the very deflections which the contours impose, and their forming therefore presents a difficult production problem.

The doming of refrigerator cabinets from a single straight channel section of sheet metal into a wrinkle free structure called for compression contouring, which was accomplished by tangent bending. Up until the war the majority of domestic refrigerator cases were made by this method, which gives a pleasant flowing line and is of less costly construction than making the case in three pieces and flash welding them together.

The Cyril Bath Co., East 70th Street and Machinery Avenue, Cleveland 8, which in 1938 had designed and built a tangent bender for this specific job, has since developed a smaller machine of broad application

for general trade use on which a variety of shapes could be made. After having built eight different designs the company settled upon the model illustrated in Fig. 1, which may be described as a contour forming machine combining the operations of stretch forming and compression forming in one unit. Using dies of various shapes and sizes, this machine is used to make difficult contours out of sheets and plates as well as shapes and extrusions which come in flat or straight sections and in the form of I-beams and channels.

This contouring machine is built with a round, power driven table and a pivoted hydraulic cylinder working in conjunction with it. On the table is fastened a form block of cast iron. Kirksite, Formite or other material approximating the shape to be formed and the metal is then ironed or stretched into this shape by the pressure cylinder.

The power of the table at the outside of the diameter must equal the maximum capacity of the cylinder. Stretching is a slower operation than compress forming, hence the table is driven at a variable speed, governed electrically. The hydraulic system can be closely controlled to maintain a

desired pressure either in stretching or compression. The cylinder is free to swivel while stretching and is locked by an appropriate device while doing compression forming or mandrel work. Operation of the cylinder is confined to the function of providing a thrust in either direction, but all off-center pull is taken on the shaper type ram on which the stretch heads or compressing members are mounted. The swiveling hydraulic head may be moved along the bed of the machine much like the tailstock of a lathe in order to obtain the best position for the particular work being done.

It has been found that the contouring machine can be applied in two principal methods: In heavier materials the severity of the contour impels the material to flow beyond its elastic limit and ironing is possible; in lighter materials where the contours are not severe the material is stretched between a point on the table and the pressure cylinder and the shape is then rolled on the table into the stretched material. This latter method is simple and very effective.

Except as applied to very ductile materials, the ironing method frequently fails to reach the elastic limit

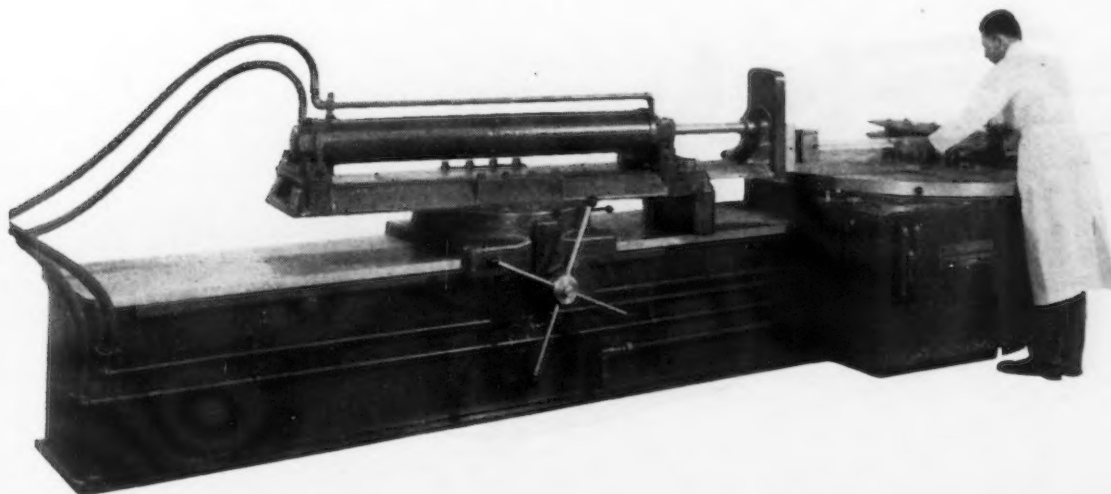


FIG. 1—Bath universal stretch and compression machine, rated at 25 tons and with 100 in. revolving table.

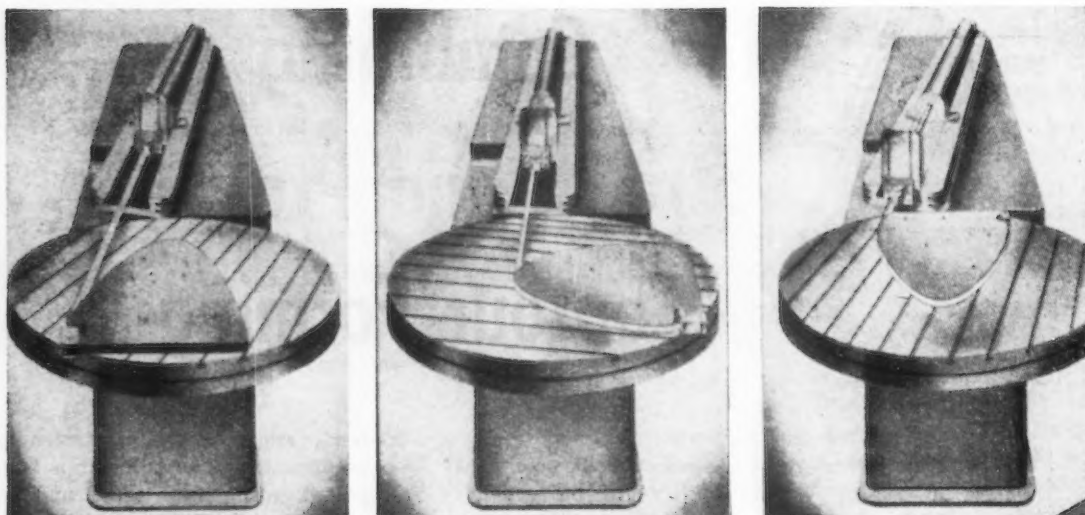


FIG. 2—Producing an airplane wing attach angle by stretch contouring. Note relative positions occupied by the cylinder with reference to the table.

of the material so that the springback is extremely variable and difficult to calculate. Attempts to compensate for springback by shaping the dies leave much to be desired because the next run of material may show different results and it is costly and impractical to make continuous readjustments for springback.

Large Shapes Overhang Table

Some modifications in the conventional cylinder table relationship have been necessary to make stretch contouring practical. By this means, very large shapes can be formed on rotary table machines simply by allowing the shapes to overhang the machine. The die cost is lower since the fitted shoes, wipers or rollers required in pressure forming are eliminated and by this method it is more practical to form many shapes directly from straight strips and sheets. The principal advantage, however, is that the material being stretched approximates its elastic limit before the

forming takes place and the element of springback is eliminated. Materials varying in tensile strength as much as 300 per cent may sometimes be worked over the same form with the same results, simply by varying the cylinder pressure and bringing the material up to its elastic limit.

How the machine is adaptable for stretch forming is illustrated in Fig. 2. In the case of the wing attach angle shown, the angle of the section changes throughout the course of the compound bend, some 13 deg. In making S-shaped curves (see Fig. 3), the extrusion angle shown is not only pulled in opposite directions, but the angle must at the same time be changed throughout the piece. Sheets of considerable width can be stretched well beyond 180 deg. The machine is also adaptable to stretch or roll material to a complete circle and turn out spiral shapes that might be subsequently welded and cut into rings. Long shallow bends or straightening of stock can be accomplished by the

overhanging feature of the dies and the pivoted cylinder.

Compress Forming

Fig. 4, on the other hand, illustrates a typical compress forming operation, that of shaping a bus bumper. This would be a very difficult piece to stretch. Similarly, the hat section shown in Fig. 5 was formed under pressure, not stretched, and was made wrinkle free. The inside of the metal in the radius was shortened by 5½ in. and the outside stretched 6½ in. in a piece that was only 36 in. long to start with. This is a very considerable movement of cold metal and it is doubtful whether such a result could be obtained by any other method.

The question whether to compress or stretch bend, is something that comes up with each piece. In some cases, both methods can be applied on a single piece. What die shapes and what kind of material will serve best—Kirkite, plastic, cast iron, Ma-

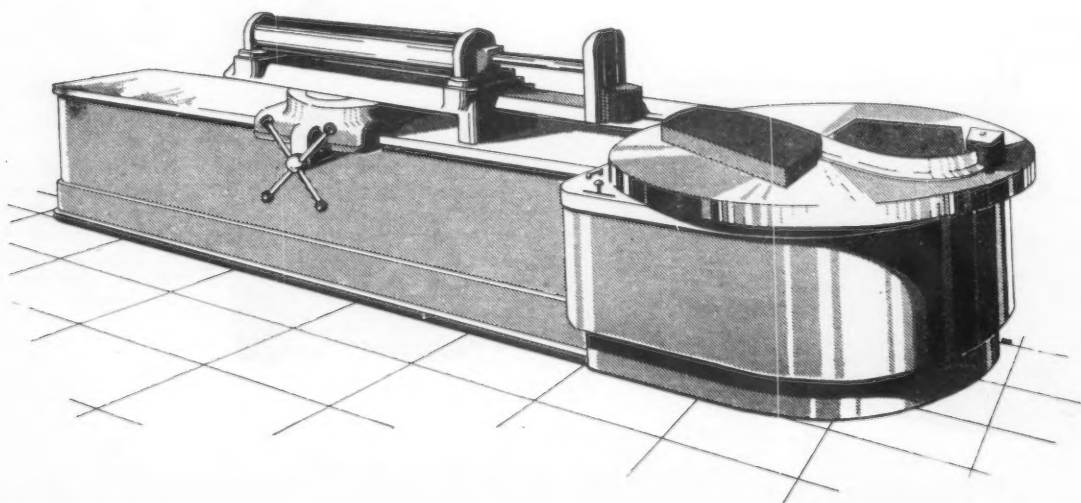


FIG. 3—By reversing table, very interesting reverse stretch bends are obtainable.

sonite, or steel? How much spring-back to allow for? Whether in the case of aluminum alloys, to form in ST condition from the refrigerator, or in SO condition and heat treat is a matter for individual judgment. What to do with shapes that cannot be stretched for various reasons, but which nevertheless change in angularity and cross-section? These and similar questions have to be decided individually. There is no general rule that applies. When stretching, the shape and type of the grippers is something that also must be decided with each job.

Where the stretching process is used, the amount of prestretching of the material before shaping is a mat-



ter of experience and must depend on the severity of the contours. It is obvious that material must not be stretched beyond the proper limits in the outer radii and this involves the necessity of stretching less than might be desired on the inner radii. The prestretching method used practically eliminates die friction and reduces scrap to a minimum. The usual method of stretch forming is to grip the metal at both ends and stretch it over a die or shape. However, in certain shapes and sections this will result in the metal being stretched more at the ends than at the center, whereas in the Bath universal contouring machine there is only a line contact between the die and the material at any time during the stretching process.

In tooling for stretch work the most



ABOVE

FIG. 4—A typical bus bumper in production. It is being compress formed at the outer diameter of the table.

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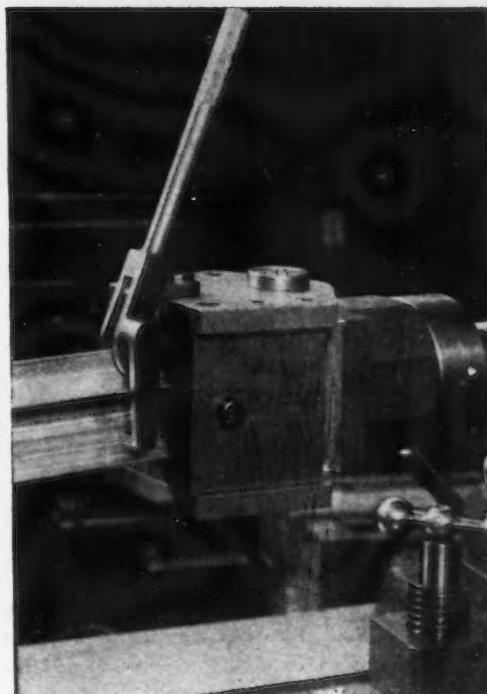
LEFT

FIG. 5—Hat steel section formed by pressure forming on contour machine. In a piece that was only 36 in. long, the inside of the metal in the radius was shortened by $5\frac{1}{8}$ in. and the outside stretched $6\frac{7}{8}$ in.

o o o

RIGHT

FIG. 6 — Heads to grip extrusions or sheets are an important feature in production.



important device is the stretch head. This must grip evenly as much surface as possible. It should clamp and release quickly for production. Where possible, hand tightening by screws is to be avoided as this leads to uneven grip and consequent breakage. A set

of standard extrusion holders is illustrated in Fig. 6. Grippers should approximate closely the shape being pulled and hand release is preferable to power unless large quantities are run, because of wire or cable interference and setup time.





FIG. 1—Forming a stainless steel part with the drop-hammer. This tool has acquired many new production uses at the Ryan Aeronautical Co.

IN the course of meeting production requirements never before experienced, the aviation industry has acted as a huge experimental laboratory from which has come a wealth of knowledge concerning the fabrication and use of all industrial materials. Stainless steel has emerged as one of the few metals which can be utilized for the transference of high temperature exhaust gases from the larger aircraft engines. In view of the continual increase in power of aircraft engines, the Ryan Aeronautical Co., San Diego, Cal., a leading manufacturer of aircraft exhaust manifold systems, undertook a close study of the formability of stainless steel.

High resistance to corrosion and oxidation is a characteristic possessed in common by the two dozen or more types of stainless steel. This characteristic must be maintained by the material when fabricated into an exhaust manifold in contact with gases ranging in temperature from 1650 to 1800 deg. F. However, heat transfer through the body of the stock to the cool air is sufficiently rapid so that the exhaust manifold actually op-

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erates at a lower temperature of 1200 to 1400 deg. F.

Besides the possession of resistance to corrosion at this temperature, the particular stainless steel selected must also lend itself to the forming of aircraft parts, and among other fabrication processes, to gas, arc and resistance welding. (See Figs. 1 and 2.) In connection with the project at Ryan to determine the most desirable formula for stainless steel, from the latter point of view, it is hoped that some of the observations and the description of tests used as guides for the selection of appropriate stainless steel stock may prove of general interest.

Three groups of stainless steel were tested. One was in the "as received" annealed condition in which the sheet undergoes a stretcher levelling operation for removal of a certain amount

of waves and buckles resulting from the final annealing heat treatment at the mill. The second group was in the annealed condition without the stretcher levelling operation, and the third group investigated contained samples in the work-hardened condition. Chemical composition of the groups was as follows:

	Group I	Group II	Group III
C.....	0.060	0.052	0.045
Mn.....	1.19	1.26	0.55
P.....	0.016	0.018	0.017
S.....	0.015	0.024	0.014
Si.....	0.61	0.61	0.63
Ni.....	11.21	12.36	8.39
Cr.....	18.38	18.42	18.11
Cb.....	0.75	0.88	0.72
Ni/Cr ratio.....	0.610	0.672	0.463

The physical properties were as follows:

Annealed As Received			
Yield strength, p.s.i....	50,600	43,550	45,250
Ult. Strength, p.s.i....	91,800	89,450	94,850
Elongation, % in 2 in.	48.0	48.75	48.0
Annealed			
Yield strength, p.s.i....	47,150	42,650	(not taken)
Ult. strength, p.s.i....	90,600	88,900	93,300
Formability.....	Fair	Best	Poor

Stainless Modified for Formability . . .

The various specimens were mounted in cross-section, polished, and etched. They were examined microscopically and photomicrographs were taken. Examination showed that group I contained the largest grain size, group II had slightly smaller grains, and group III, the smallest. Group II contained the least number of free ferrite particles with groups I and III having increasingly more.

The annealed specimens were annealed by air quenching from 1980 deg. F. This resulted in a slight number of precipitated carbides which were dispersed at random throughout the material. Had the quench been more severe, such as that produced by the use of oil or water, this random dispersion of carbides would not have been noticeable. However, the quenched stainless steel differed from the as-received annealed only with respect to the dispersion of the precipitated carbides. The work-hardened samples differed from the as-received in that their grains were elongated to a greater extent in the direction of deformation.

Effect of Nickel

From this test it was concluded that, although it is logical to believe that the nickel content has some effect upon the grain size, it does not entirely control it. Other factors, such as methods of operation, probably contribute to grain size. It was also seen that the amount of free ferrite is inversely proportional to the nickel content and that the tensile strength is directly proportional to the amount of free ferrite and its distribution. The forming properties become better as the amount of free ferrite decreases. An 18-8 stainless steel of high nickel content, it was recognized, will have better forming properties than one of low nickel content. Likewise, the high nickel austenitic stainless will absorb more work than that of low nickel composition. Therefore, for good forming properties, 18-8 stainless steel having a nickel content of 11 to 12 per cent is better than one of 8 per cent.

Following these tests, a group of observational experiments were performed in the Ryan Aeronautical

. . . Columbium stabilized stainless steel, type No. 347, has been found to possess proper ductility and good welding properties on the basis of tests described here for forming aircraft parts subject to high temperatures.

drop hammer department in order to check the formability of 18-8 stainless steel sheet. Formability ratings were derived from data on the percentage of parts rejected in a standard production forming operation, supplemented by information concerning necessity of intermediate annealing, see Fig. 3, and types of failure. Magnetic permeability studies were made with a device which measured in decigrams the force required to remove perpendicularly from the face of a standard test specimen a magnet of constant flux.

On the basis of the foregoing experiments, such observations were arrived at, as that the formability of 18-8 stainless steel sheet is determined only in part by the as-received annealed physical condition of the material, and that any given sheet of annealed 18-8 is, of course, more easily formed in the first stages than sheet not annealed before forming. However, 18-8, having inherent tendencies toward rapid work-hardening, will

present forming difficulties after the first stages even though received in the annealed state. Also, this steel might have directional characteristics, or a preponderance of grains oriented in the same direction, which present forming difficulties even though the metal is annealed between stages. This difficulty does not appear to be associated with work-hardening.

Furthermore, it was seen that the rate of work-hardening is largely a function of the nickel-chromium ratio, other factors being constant. There is evidence to show that other alloying elements, such as carbon, manganese, columbium, and titanium, have a bearing on forming charac-

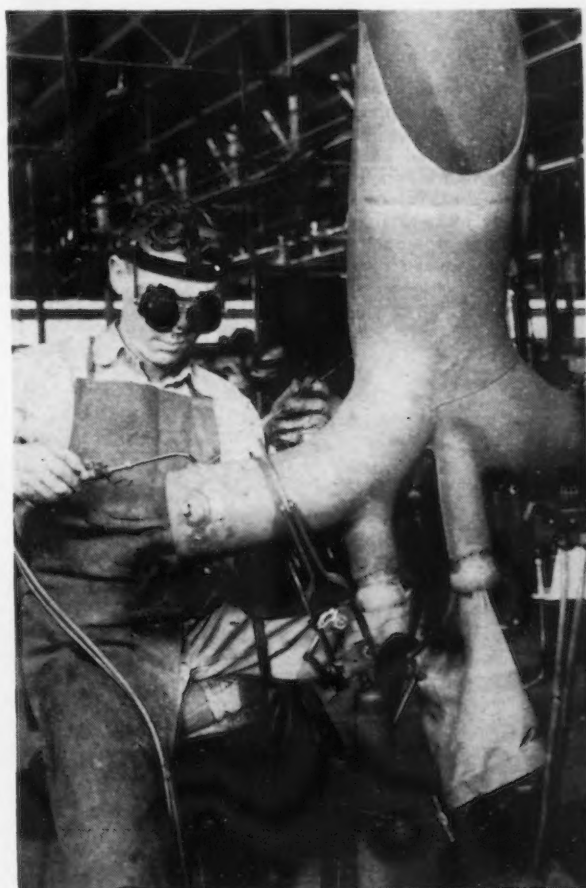
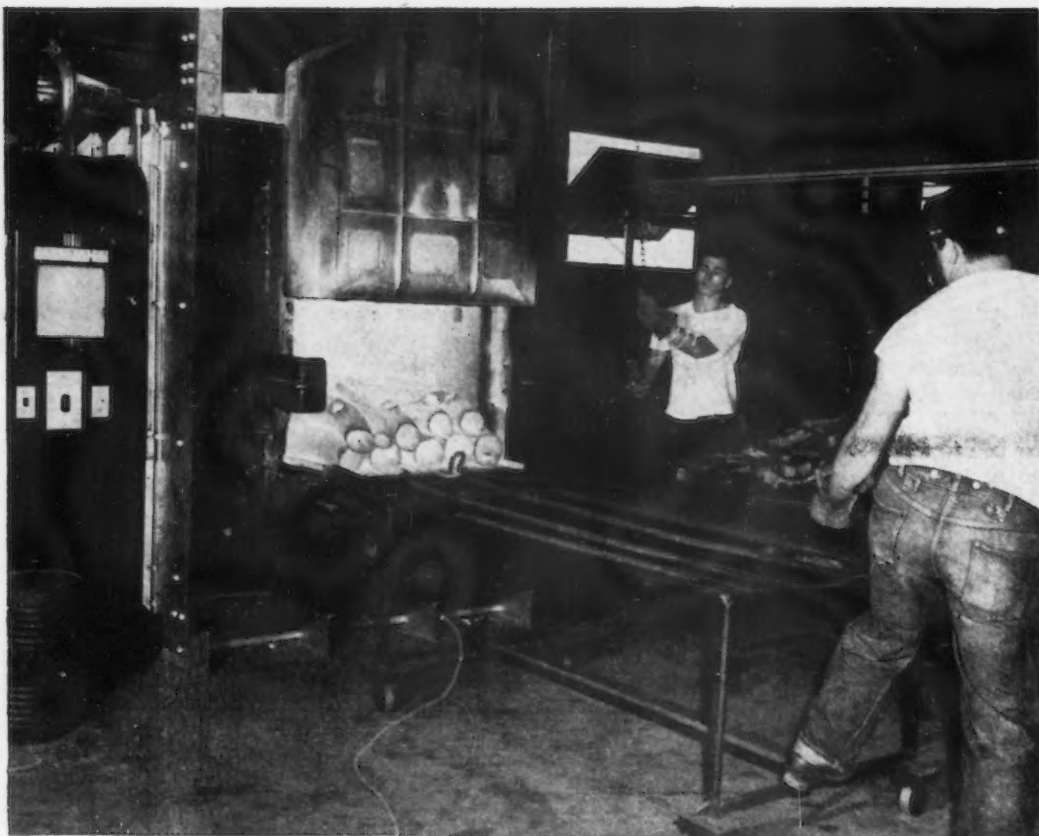


FIG. 2—Typical oxy-acetylene gas welding operation performed upon a stainless steel part. Here the operator is adding stainless steel to the weld zone by use of a filler rod.



LEFT

FIG. 3—Showing the heat treating furnace and loading apparatus at the Ryan Aeronautical Co. This furnace, which is controlled by an electric recording thermometer, is used to anneal stainless steel parts which have become work-hardened by forming operations.

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BELOW

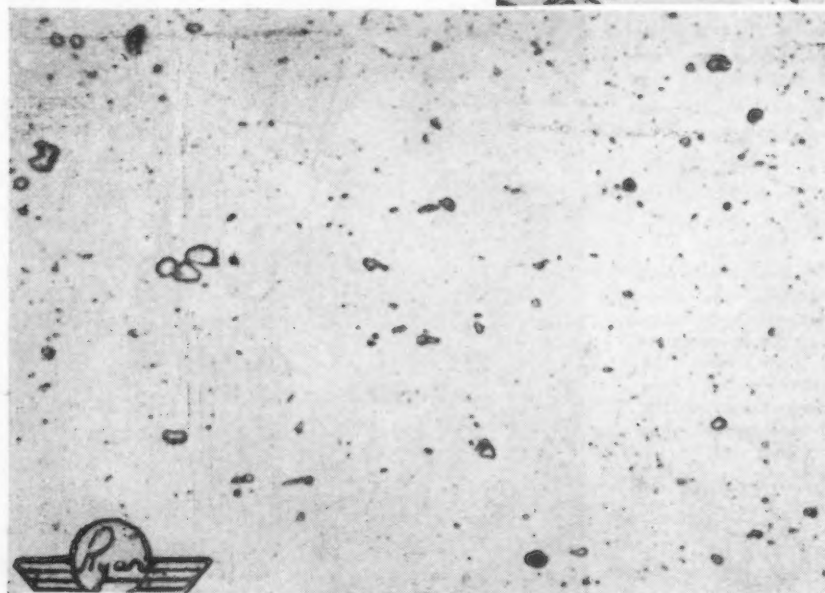
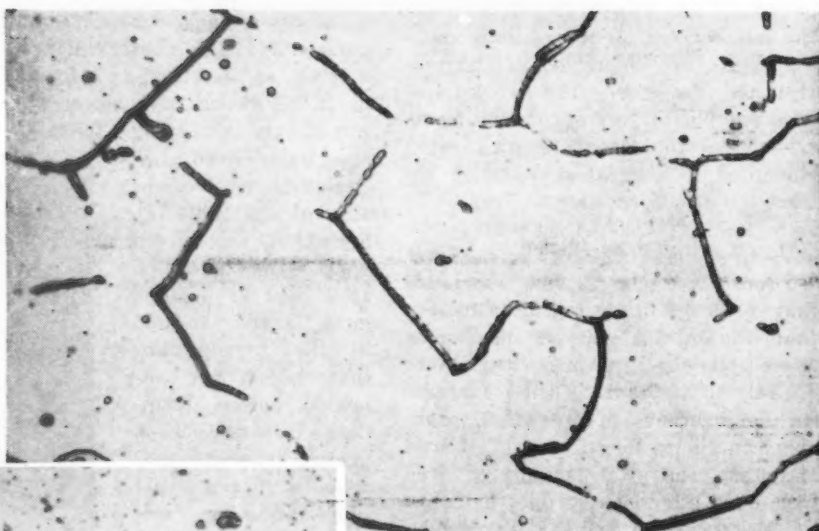
FIG. 5 — Photomicrograph of a section of unstabilized stainless steel, Type No. 302, showing the precipitated chromium carbides distributed along the grain boundaries. These carbides form a path for intergranular corrosion to follow. Original magnification 500X, reduced one-half.

teristics. The gain in magnetic permeability of 18-8 as a result of cold working appears to be chiefly a function of the nickel-chromium ratio, and this gain appears to be associated with directional characteristics.

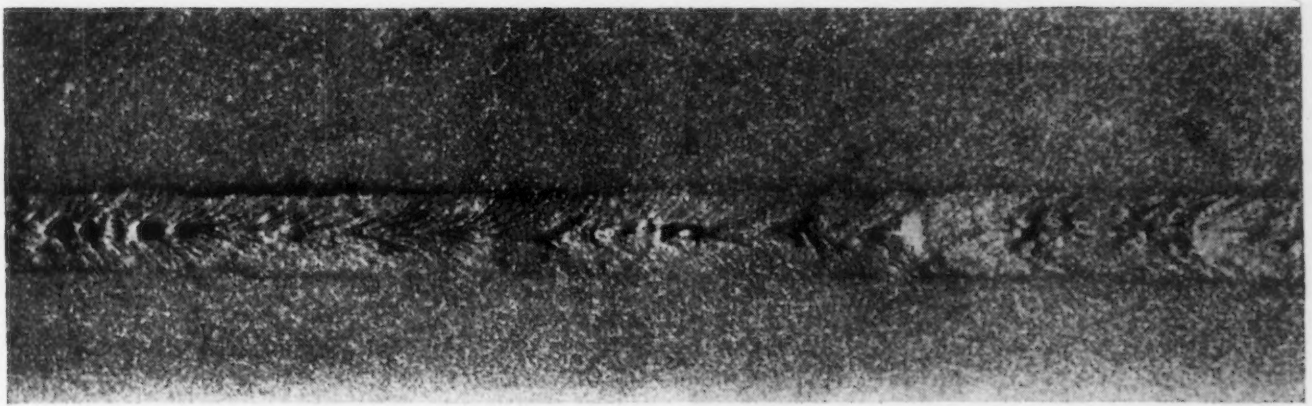
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BELOW

FIG. 4—Photomicrograph of a section of columbium stabilized stainless steel type No. 347, showing the well distributed precipitated carbides, presumably columbium carbides. The fact that these carbides are dispersed precludes their possibility of becoming paths for corrosion. Original magnification 500X, reduced one-half.



A special test was conducted to determine whether or not "dead soft," or fully annealed 18-8 stainless steel, was more easily shaped or processed than 18-10. In order to make this test, a series of similar cuttings of the most difficult parts to form were made. These groups were shaped in the drop hammers, annealed, passivated, pickled and welded. One set was welded with atomic hydrogen. Facts elicited as a result of the test were, that the dead soft 18-8 material reaches the breaking point more quickly than 18-10, and that the material has a tendency to wrinkle in one place rather than over a wide



ABOVE

FIG. 6—Showing close-up of the weld seam of a stainless steel flange weld. Notice the porosity evident in this weld of type No. 321, titanium-stabilized stainless steel.

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less steel is from 30 to 40 per cent greater at a temperature of 1100 deg. F. than that of type No. 321 titanium stabilized stainless.

Titanium vs. Columbium

Because it was once suggested by the standards committee that the aircraft industry adopt titanium stabilized stainless steel as a standard instead of having both columbium and titanium stabilized stainless, the Ryan Aeronautical Co. laboratory made a comparison of these two types. The use of titanium or columbium in the formula of stainless steel is, of course, to control the carbon precipitation which lowers the corrosion resistance of the metal. When these metals are added to the chromium-nickel stainless steels, they prevent

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BELOW

FIG. 7—Showing close-up of the weld seam of a flange weld made on a type No. 347, columbium-stabilized stainless steel. Porosity is not evident here.



area. These wrinkles are easily removed but check the material if allowed to get very sharp. The scale formation and response to the various welding techniques is similar in all respects to other material tested. The workability, as reported by the drop hammer foreman, for 18-10 is 100 per cent and for dead soft 18-8, 80 per cent. In regard to forming properties, this particular dead soft material is inherently inferior to the 18-10. It was also established that slight differences in percentage of certain alloying elements have a noticeable bearing on loss of ductility and a harmful change in grain structure on cold working.

Analysis of failures on exhaust manifolds brought to light the fact that nearly all failures in exhaust systems can be corrected by a change or modification in design, as the failures could not be directly attributed to defective material, faulty welding, or other fabrication procedure. It is possible to thin out the metal by excessive working to an extent resulting finally in a part which would be equivalent to one fabricated of a much thinner gage material. Associated with this conclusion is a survey of the latest research work showing that the creep strength of type No. 347 columbian stabilized stain-

the formation of harmful chromium carbides by forming titanium or columbium carbides which are not harmful. (See Fig. 4). This modification is called "stabilizing."

It has been noticed in numerous exhaust manifolds which have been in service up to as long as 4000 hr., that although carbide precipitation is present in considerable amount, the distribution is such that rapid corrosion will not proceed. The presence of precipitated carbides results in poor resistance to acid solutions, but as formed in the stabilized grades they are resistant to the products of gasoline combustion. In the case of columbium stabilized stainless, the carbides formed are dispersed at random throughout the material and form no definite pattern for corrosion to proceed, Fig. 5.

It has been known that titanium is more readily volatilized from fused weld metal than columbium, with reported losses of titanium as high as 80 per cent. A search of recent literature disclosed no refutation of this knowledge, although some sources offer data from limited tests showing that in certain cases a normalized weld of titanium stabilized metal gave no evidence of intergranular corrosion, although it shows plenty of porosity. (See Fig. 6). Extensive

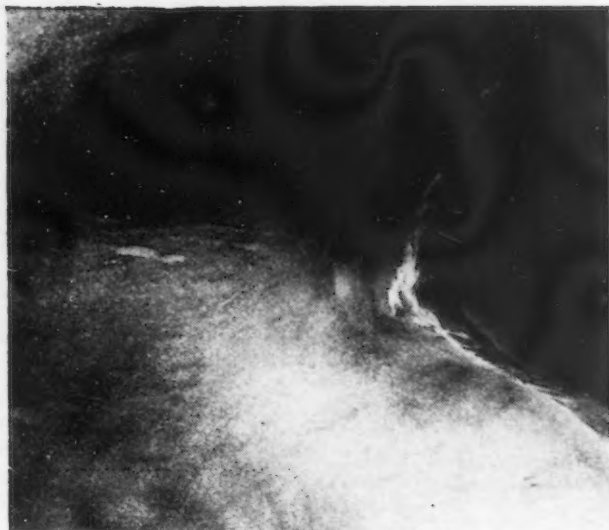


FIG. 8—Close-up photograph of a short radius curvature section of a stainless steel part formed by the drop hammer. Clearly evident are the wrinkles which result when this task is attempted with stainless steel of insufficient ductility.

studies have demonstrated that columbium stabilized steel welded parts, Fig. 7, can be used safely without a stabilizing heat treatment, whereas titanium stabilized steels should have the benefit of this special heat treatment.

The Ryan Aeronautical Co. performs a large part of its welding operations by direct fusion of turned sheet edges, without welding rod of any kind. Thus, the admitted volatilization of titanium in the direct fusion of titanium stabilized sheets would present an objectionable difficulty in this type of operation. Two conclusions relative to the characteristics of the two types have been arrived at: First, whenever possible, type No. 347 should be used for gas welding, as reworks are at a minimum when using this type; and second, that it is far easier to train a welder to weld type No. 347 than type No. 321.

Following these tests, a series of studies was conducted to determine the relative ductility characteristics of columbium and titanium stabilized stainless steels. If ductility is insufficient, wrinkles are likely to result when forming. (See Fig. 8). In addition, ductility is important for minimizing poor fits in welding, as well as excessive breakage, annealing, planishing and die staging. Tests were made of many different heats of columbium and titanium stabilized stainless steel from the various producers. These samples also had different finishes, or surface roughnesses. It was found that the titanium stabilized stainless steel was superior in ductility to the columbium stabilized product. The formability of type No. 347, although slightly inferior to that of type No. 321, is en-

tirely satisfactory for the requirements at hand, and no troubles in forming have been encountered in production that can be attributed to the use of columbium in 18-8 steel. Also, it was determined that a finish equivalent to a 2D (dull cold rolled) finish was the best for use in drop hammer forming operations. A smoother finish than this does not permit a firm grip of the metal by the dies when the punch strikes the die. Much greater success is experienced if the metal surface is roughened slightly. Further, it was determined that a high nickel-chromium ratio allows for a ductile metal, one which hardens reluctantly while being cold-worked, and one which embodies good welding properties. If the nickel content remains about 10.5 per cent, we may be reasonably sure of a ductile, trouble-free material. It has been found that the most desirable formula for this use is:

Element	Per Cent
Carbon.....	Less than 0.06, preferably less than 0.05
Manganese.....	1.30 to 1.50
Phosphorus.....	Less than 0.02
Sulphur.....	Less than 0.015
Chromium.....	More than 17.0
Nickel.....	More than 10.5
Columbium.....	More than 8 times the carbon content

This brief discussion of some of the properties of the stainless steels with respect to their use in aircraft production has touched upon only two of the many members of the stainless steel family. Within the limits of this article no adequate treatment could be made of most of the important characteristics of this promising group of alloys, such as, coefficient of expansion, heat conductivity, effect of various heat treatments, hardening characteristics and corrosion resistance.

Effect of Cold Rolling on the Properties of Steel Strip

THE effect of rolling at temperatures of -297°F to $+392^{\circ}\text{F}$ on the tensile properties, deformation, resistance, magnetic properties, tendency to intercrystalline corrosion and structure of steel strip, 0.0787 in. wide, have been reported by W. Puzicha in the Nov. 25, 1943, issue of *Stahl und Eisen*. The tests were made on steels of the following analyses:

	(1)	(2)	(3)	(4)	(5)	(6)
Carbon, per cent.....	0.05	0.06	0.13	0.19	0.57	0.25
Chromium, per cent.....	19.6	15.4	15.0	14.4	0.7	0.7
Nickel, per cent.....	9.1	1.4	1.1	0.22	.....	.....
Manganese, per cent.....	.....	14.5	16.6	18.7	1.0	1.0
Molybdenum, per cent.....	.....	.....	.....	.....	0.23	.....

The deformation resistance of austenitic steels were found to increase sharply with increasing reductions per pass, but this resistance could be reduced by lubrication with rape oil. The deformation resistance also increased with decreasing temperature. Steel (1) attained its maximum tensile strength by reducing it a small amount in each of a large number of passes. One chromium-manganese steel and a nitrogen-treated chromium-manganese steel attained a tensile strength of almost 22 lb. per sq. in. However, the strength of these steels was much less after heavy reductions in a few passes. Steels (1), (5) and (6) attained a

tensile strength of only 18 to 22 lb. per sq. in. after cold rolling.

When the austenitic steels (not nitrogen-treated) were given heavy reductions per pass, the magnetic saturation value reached a maximum and then decreased, but when reduced by small amounts per pass, this value steadily increased. In the cold rolling of the austenitic steels, the magnetic transformation was markedly dependent on the temperature. There was no relationship between the phase condition as determined by magnetic saturation values and the sensitivity to intercrystalline corrosion. This sensitivity decreased with increasing deformation.

Side Feeding of Steel Castings

A STRIKING feature of steel foundry practice during the past few years has been the development in the side feeding of castings. In the United States this has taken the form of the atmospheric head, while in Great Britain the whirlgate head, which depends for its working on the control of the direction of solidification by the temperature gradient, is being used.

From investigations of this latter practice made by B. Gray, and reported in a paper to the Steel Castings Research Committee of the British Iron and Steel Institute, it was found that although the directional control of freezing by the temperature gradient is an important factor in the quality of steel castings, other influences arising from the mechanism of freezing of the steel should not be ignored.

This conclusion was based on four experiments with 4-in. square bars which were cast in the following ways:

- (1) Cast vertically with a bottom runner and top head.
- (2) Cast horizontally with a whirlgate head at one end.
- (3) Cast vertically through a top head.
- (4) Cast vertically with a whirlgate head near the bottom.

It was found that the rate of increase in wall thickness was less on vertical than on horizontal walls, and different again when the head was applied at the bottom. Crystalline structures also differed and two forms of solid resulted.

To explain these results, it was

suggested that convection currents play an important part in the solidification of steel, and that they, in turn, are affected by the size and shape of the casting. For some castings the normal method of bottom running with the top head is satisfactory in spite of the temperature gradient being in the wrong direction. The full benefit of the favorable temperature gradient with the whirlgate head is not obtained because high melting point material collects at the bottom of the head and may freeze earlier than the low melting point material in the casting if the temperature difference is not sufficient. The segregated material can also escape into the head more easily with a top head as it tends to rise naturally owing to its lower specific gravity. In doing so, it enriches the steel in the head and lowers its freezing point below that of the casting which, of course, helps feeding. It is only in a top run casting with a top head that the temperature gradients and the relative freezing points of the part of the casting last to freeze and of the material fed to it are all favorable.

It has been common experience with the whirlgate head that failures are more likely to occur when the steel is cold. It seems probable that small crystals of high melting point material had already formed in the liquid while the casting was still being run, and froze rapidly on contact with the sand. With solidification starting at such an early stage, there was no time for the lower rate of dissipation of heat in the head to have its full effect in retarding solidifica-

tion there, as compared with the cooling rate in the casting.

In the light of these experiments, the following practical applications to the foundry can be made:

- (1) Atmospheric pressure and not gravity is the effective motive force in the feeding of all castings.
- (2) Top running through the head is effective in sections greater than 3 in.
- (3) Bottom running with top heads is satisfactory under the same condition.
- (4) Top heads are not efficient in sections less than 3 in. thick.
- (5) Top heads are not efficient in horizontal feeding.
- (6) Side heads give a greater depth of solid wall in horizontal feeding and are, therefore, to be preferred in certain cases.
- (7) Side heads are effective to a considerable horizontal distance from the head.
- (8) Side heads in horizontal feeding are liable to leave slight axial unsoundness in the casting.
- (9) Side heads applied to the bottom of a casting give the best results in sections under 3 in. thick and are quite effective for thicker sections when applied to that the head keeps the bottom of the casting hot by conduction.
- (10) Side heads are not so effective when applied to the top of a casting.
- (11) The conduction of heat from the head to the casting during freezing is important and is controlled by the size of the head and the design of the connection with the casting.

Chromium Inoculants Developed for Cast Iron

TWO new stabilizing inoculants for cast iron which are said to provide the hardness and wear resistance of chromium alloyed cast iron without the normal increase in depth of chill that serves to impair machinability have been developed by the Electro Metallurgical Co., a unit of Union Carbide & Carbon Corp. Known as CMSZ alloys 4 and 5, these ladle addition agents are a handy means of alloying with chromium while graphitizing.

These inoculants also are said to improve the tensile and transverse strengths of cast iron, reduce growth at elevated temperatures, and resist the effects of oxidation and anneal-

ing. In some irons, benefits are obtained with sufficient CMSZ inoculant to add 0.35 per cent chromium to the melt. By using a balanced mixture of CMSZ inoculant and SMZ, a graphitizing agent not containing chromium, as much as 2 per cent chromium can be added to cast iron without impairing machinability.

The grade and amount of CMSZ inoculant for the foundryman to use depend on the composition of his base iron and the properties desired in the castings. For irons having a carbon equivalent (calculated by adding 0.3 of the silicon and phosphorus contents to the total carbon content in per cent) of less than 4 per cent,

CMSZ No. 4 is recommended. For irons having a carbon equivalent of 4 per cent or more, CMSZ No. 5 is recommended. For irons having a carbon equivalent of less than 3.5, it may be desirable to use a mixture of CMSZ and SMZ inoculants. The compositions of each type of inoculant are shown below:

Composition of Inoculants for Cast Iron

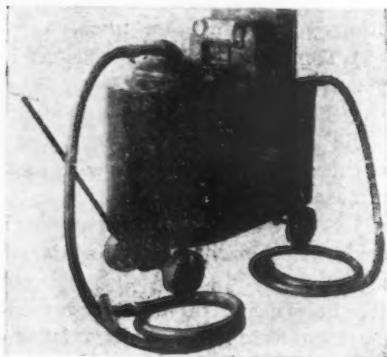
	CMZ - 4 per cent	CMZ - 5 per cent	SMZ per cent
Chromium	45-49	50-56	—
Manganese	4-6	4-6	5-7
Silicon	18-21	13.5-16.0	60-65
Zirconium	1.25-1.75	0.75-1.25	5-7
Carbon	3.0-4.5	3.5-5.0	—
Iron	—	—	approx. 20

New Equipment . . .

Plant Service

. . . Recent developments in sump cleaners, air purifiers, lubricating devices, marking machines and other accessories for the metal working shop are described in the following pages.

THREE sump tank cleaning machines have been announced by *S. R. Carnes Co.*, 2066 Helena Street, Madison 4, Wis. The Model



70 combination sump tank cleaning machine and centrifugal filter has a capacity of from 25 to 40 gal. of oil or coolant per min. It has full automatic controls and is equipped with three motors with a total rating of 1½ hp. The Model 50 sump tank cleaning machine, illustrated, will pump 30-35 gal. of oil or coolant per min. The pumping equipment consists of a positive displacement rotary vacuum pump operated by a V-belt using a ½-hp. motor. The Model 115 combination mixing and dispensing truck has a capacity of 40 gal. per min. and has a vertical, ball bearing 1/3-hp. motor.

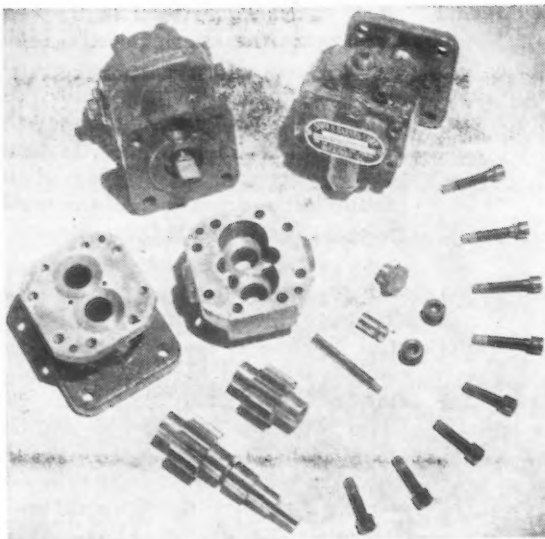
Compressed Air Purifier

DESIGNED to eliminate free moisture, oil and all foreign matter with a heavier specific gravity than air from passing through the compressed air line, the Model A-1 Pur-O-fier has been announced by *Bird-White Co.*, 3120 W. Lake Street, Chicago 24. Using positive centrifugal action as the medium for purification, it operates with from 1 to 5 cu. ft. of air. The unit weighs only 1¼ lb. and is 3½ in. in diameter by 59/16 in. deep. Opening the petcock in the bottom drains the sump. Standard units have ½-in. female pipe connections for intake and discharge pipes.

Rotary Lubricant Pump

A LOW-PRESSURE rotary pump for pumping all types of liquids having lubricating qualities has been announced by *John S. Barnes Corp.*, Rockford, Ill. Capacity of the pump ranges from 1 gal. per min. at 600 r.p.m. to 4 gal. per min. at 2400 r.p.m. A feature of the

Henning Mfg. Co., Milwaukee. A feature of the valve is a stuffing box with gland nut in the valve-stem assembly. The valve is made in all-bronze construction with lubricating channels in the disk and seat for water-hydraulic service and in semi-steel without lubricating channels for oil-hydraulic service.



pump is the Barnes patented spur gear tooth form, which eliminates excessive sliding and reduces slippage of the fluid to a minimum. Each tooth completely fills the mating space as the gears mesh and perfect sealing action is effected. A relief valve which is adjusted and set at the Barnes factory under operating conditions simulating those of the plant in which the pump is to be installed affords protection against excessive pressures. Maximum pressure range on the pump is 200 lb. per sq. in. and tests show that vacuum to 26-in. mercury gage is possible.

Hydraulic Valve

DEVELOPED for leakproof service on ¾-in. hydraulic lines at pressures up to 300 lb. per sq. in., the Nopak ¾-in. hand-operated hydraulic valve has been announced by *Galland-*

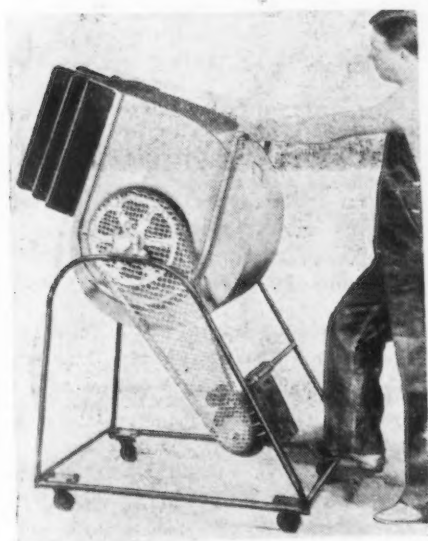
Ball Bearing Cleaner

A PRECISION ball bearing cleaning machine has been announced by *L & R Mfg. Co.*, 577 Elm Street, Arlington, N. J. From 50 to 100 bearings of various sizes can be pre-cleaned in the basket of the unit. In the pressure cleaning tank continuously filtered solution under 6 to 10 lb. pressure per sq. in. is forced through each bearing individually. Filtered compressed air is provided to remove surplus sol-



NEW EQUIPMENT

vent from the bearing while it is still on the pressure cleaning spindle. The process may be observed through the glass lid, with visibility aided by a plastic hooded lamp located within the tank opposite the spindle.



Utility Blower

A PORTABLE type of industrial utility blower Properaire that supplies air pressures from a gentle diffused breeze-flow up to a high velocity directed beam has been announced by *Grand Rapids Tool & Die Co.*, 1200 Godfrey Avenue, S. W., Grand Rapids, Mich. Numerous changes in the directional flow of air can be accomplished through adjustment of the louvre blades in the discharge fins and by swinging the blower housing to any of the several discharge positions provided. Changes in discharge pressure are effected by altering the blower wheel speed through a variable speed pulley. Suggested uses for the blowers are cooling, ventilating, drying and fume and dust removal.

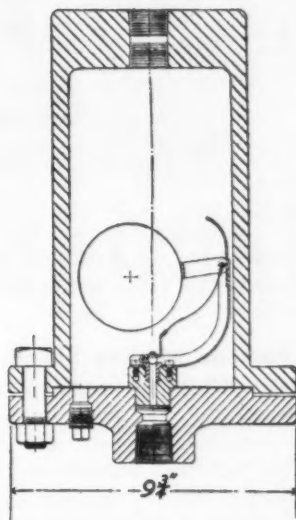
Portable Air Duct

A PORTABLE air duct which is flexible but non-collapsible has been developed by *E. I. du Pont de Nemours and Co.*, Wilmington 98, Delaware, for either blower or exhaust systems. The duct is a sleeve or tube of standard Ventube impregnated cloth, either regular or fire resistant, with a tempered steel helical spring inside it. The maximum air-flow opening is maintained regardless of whether the duct is bent sharply or the system is blowing or sucking air. When bent to an angle of 180 deg. it will exhaust eight times more air than the old style tubing, it is claimed. Ventube is made by impreg-

nating and coating especially selected fabrics with a high grade abrasion resistant compound that is water resistant and impregnable to air. Designed primarily for auxiliary ventilation in ship construction, loading and unloading, cleaning or repairing ships, it is also suitable for other industrial uses such as building and maintenance of vats, tanks, tank cars, boilers or for rapidly changing air in work rooms or drying rooms.

Air Line Water Trap

FOR draining water from compressed air systems under pressures up to 1000 lb., a high-pressure "snap-action" air trap, No. 71-315, had been announced by *Armstrong Machine Works*, Three Rivers, Mich. The ball float is designed to withstand hydrostatic pressures of 1500



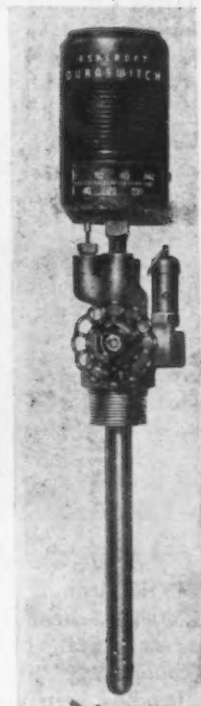
lb. The ball float is connected to the short valve lever through a flat strip of stainless steel spring. As the incoming water raises the ball float, the initially concave bent spring is so attached to the float that as the spring moves past dead center it snaps the float up and the valve is thrown wide open. Drainage is immediate. When the water level drops, the cycle is reversed and the valve snaps tight in closing. No throttling effect occurs and it is claimed that wire drawing is eliminated. It is also claimed that the trap will handle all ordinary oil and dirt without clogging.

Compressor Control

THE Ashcroft Compressor-Trol which combines seven devices for the control of compressor operations into a single unit has been an-

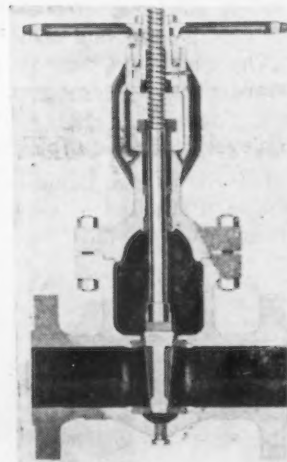
nounced by *Manning, Maxwell & Moore, Inc.*, Bridgeport 2. Made in 1/2, 3/4 and 1 1/4-in. sizes and covering all requirements of tank mounted compressors up to 15 hp. or 60 cu. ft. per min., the instrument eliminates the necessity for using pipe and pipe fittings. The muffler on the compressor discharges into the tank. The muffler acts to break up the discharge and to disperse the air in a manner which insures adequate mixing with the cooler gases in the tank to reduce temperature and moisture content before delivery.

The Compressor-Trol comes equipped with the Ashcroft Duraswitch and with either an electric or mechanical attachment for operating the two-way unloading valve.



Steel Gate Valves

A LINE of cast steel gate valves has been announced by the *Edward Valve & Mfg. Co.*, East Chicago, Ind. To achieve close alignment of all working parts, close fitting wedge guide ribs are constructed by a new method which eliminates unnecessary, wear producing drag



across the seating faces. Seat rings of the valves are hard surfaced and welded to the body. Specially built fixtures permit hydrostatic testing of

NEW EQUIPMENT

both seating faces simultaneously in contrast with the customary procedure of testing one face at a time. All valves 4 in. and larger, are ball bearing equipped.



Floor Cleaning Machine

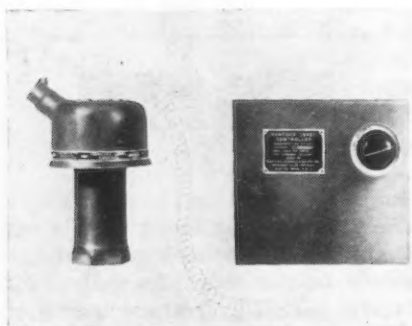
FOR cleaning heavy traffic industrial floors of incrustated grime, grease, metal cuttings and dirt, the Tennant "K" industrial floor machine has been announced by G. H. Tennant Co., Minneapolis. Dirt and grime are sheared from the floors by a heavy-duty 16-in. drum type steel wire brush revolving at 1725 r.p.m. driven by a gasoline or electric motor. The machine can also be used for floor sanding and steel wool buffing.

Wheelbarrow Work Platform

A WHEELBARROW type work platform has been announced by Universal Fittings & Scaffolding Co., Zelienople, Pa. The platforms are fabricated from welded tubular steel with 6-in. safety treads and 7-in. risers. They are available with either safety steel mesh top or heavy plywood for the top and tool bench space. The platforms are available in standard sizes of 4, 5, 6 and 8 ft.

Level Float Control

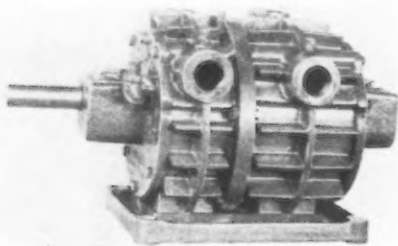
DESIGNED to give liquid level to within a fraction of an inch, a level float control has been an-



nounced by Manning, Maxwell & Moore, Inc., Bridgeport, Conn. The control is free from electrical switching or contacts within or without the float chamber. There are no levers, linkages, bellows, stuffing boxes, cooling fins, mercury switches or wearing parts. By adjusting a screw the level of the liquid can be raised or lowered.

Rotary Air Pump

A TWO-CYLINDER pump of the rotary type used for air pressures up to about 50 lb. per sq. in. and for vacuum up to about 28.7 in. mercury has been developed by Leiman Bros., Inc., 144-74 Christie Street, Newark, N. J. While one cylinder is used for pressure, the other can be used for vacuum or both can be used for pressure or for vacuum.



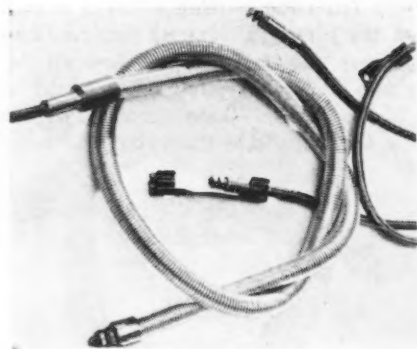
One cylinder can pump into the other to increase the air pressure or one may pump from the other to increase the vacuum.

Package Marking Stamp

A ROLLER type marking stamp made to hold both fixed dies, interchangeable type dies or a combination of both has been developed by Adolph Gottscho, Inc., 190 Duane Street, New York. The drum is equipped with as many channels as are needed for the interchangeable type. The units are automatically inked by one or two self-inking rollers. Assemblies have been manufactured for imprinting in two or three colors side by side. The units are made to imprint impressions on boxes or crates, to identify metal sheets or mark bars, angles or tubes with identifying marks.

Electric Heat Unit

A electric heat unit that can be coiled in close or in widely spaced turns around pipes and cylinders, spiraled around molds or fitted to odd contours has been developed by H. & A. Mfg. Co., Inc., Buffalo and Binghamton. It can be made in varying lengths and diameters and in capacities upward to 15-20 watts per lineal inch. Exact temperatures up to 1000 deg. F. can be maintained without deterioration of the steel-ceramic



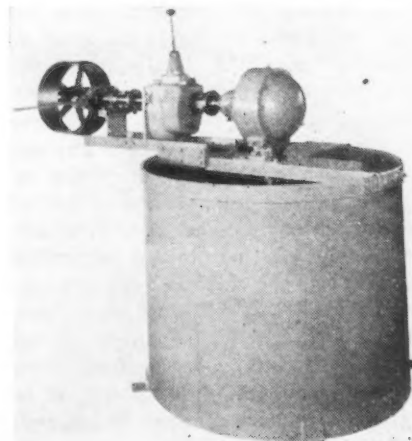
structure. Heat can be applied through direct contact or can be transferred through clips or fixtures of various designs.

Fluorescent Lamp Lead Wire

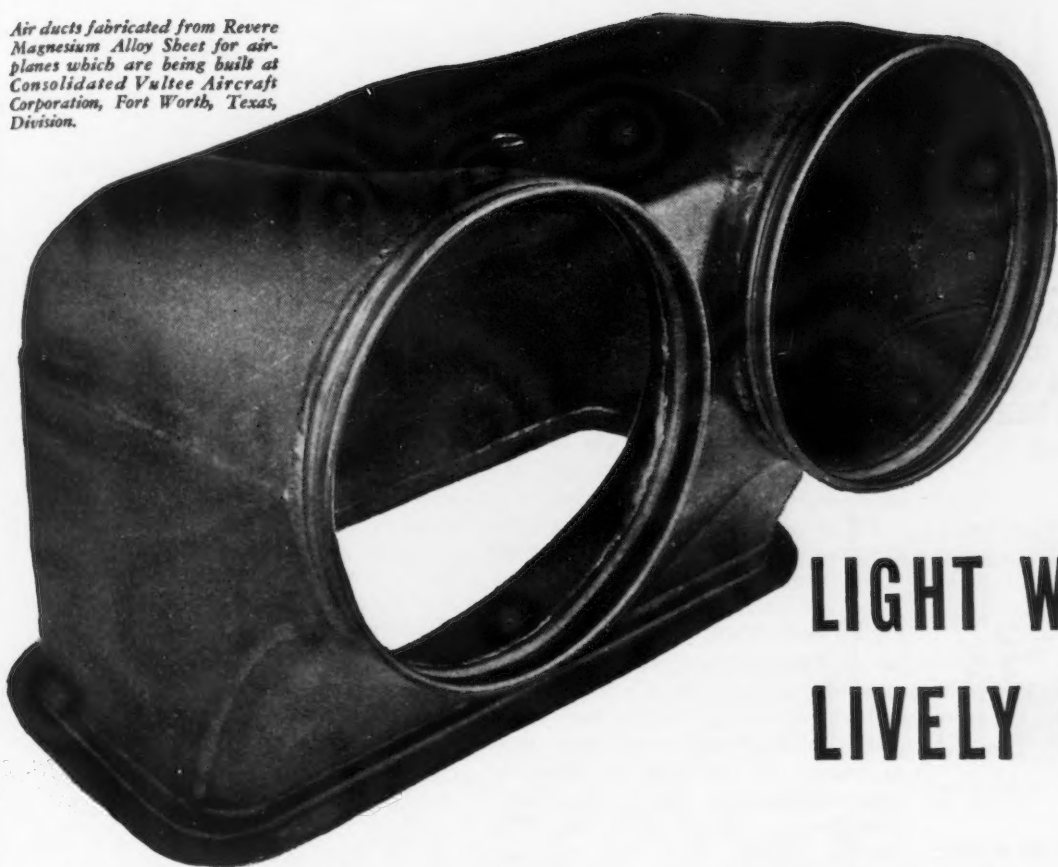
A DELTABESTON Flamenol thermo-plastic insulated lead wire for use in all types of fluorescent lamp ballasts has been announced by General Electric Co. The wire is approved by the Underwriters' Laboratories for use as lead wire in lighting fixtures wherever 600-volt service is required. It is approved for 176 deg. F. The insulation of the wire is super-aging and resistant to flame, oils, acids and alkalis. The wire is available in solid and stranded conductors, sizes 16 and 18 AWG.

Mixer

ADAPTED to the mixing of liquids and semi-liquids from solids and to the mixing of dry powders, the Anderson - All-Mix has been announced by Anderson Engineering Co., Inc., 221 Seventh Avenue, Hawthorne, N. J. For initial breakdown at low speeds, a three-speed automobile transmission is provided. When the consistency has become more uniform, the machine gears are shifted to a second speed giving a quicker run and for the final high speed mix a short period of time only is required to complete a satisfactory product. A 200-gal. tank is illustrated.



Air ducts fabricated from Revere Magnesium Alloy Sheet for airplanes which are being built at Consolidated Vultee Aircraft Corporation, Fort Worth, Texas, Division.



**LIGHT WEIGHT IS
LIVELY WEIGHT!**

REVERE Magnesium Alloys

DON'T be misled by the inevitable fact that thus far the use of magnesium for structural purposes has been largely confined to the airplane. As more and more of this remarkable light metal becomes available (and more is being released every day) you will find magnesium creating the new light metal age, in which a great many things that move will do so more quickly and economically and easily because magnesium is used in them.

Remember that it costs money to move anything—trucks, trailers, elevator cages, railroad cars, buses, *anything*. And it costs money to ship to, and move around a plant, the materials of which they are made. It takes effort to move such common articles as vacuum cleaners, hand tools, portable typewriters, chairs. Weight reduction will be *so* important after the war!

Revere Magnesium Alloys are available now in the form of sheet and plate, rod and bar, tubes and shapes, forgings and forging stock. The Revere Technical Advisory Service will

gladly assist you in obtaining magnesium's maximum advantages...Write for your complimentary copy of the new 32-page booklet, "Revere Magnesium Alloys and the Light Metals Era."

THE FOUR REVERE MAGNESIUM ALLOYS

Working Characteristics	"M"	"FS-1"	"J-1"	"0-1"
FORMABILITY	Good	Excellent	Fair	*
STRENGTH	Good	Good	Excellent	Excellent
WELDABILITY	Excellent	Good	Excellent	Excellent
DEEP DRAW	Excellent	Good	Fair	*
FORGEABILITY	Excellent	Excellent	Excellent	Excellent
MACHINABILITY	Excellent	Excellent	Excellent	Excellent

*Heat-treatable extrusion or forging alloy

REVERE
COPPER AND BRASS INCORPORATED
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Founded by Paul Revere in 1801

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Assembly Line . . .

STANLEY H. BRAMS

• Industry and services cross swords on policy for reconversion . . . Strikes break out anew in Detroit plants . . . Bargaining rights for supervisors will be an issue in a Packard case whose call by the NLRB may be significant.



DETROIT—Something of a tug-of-war on reconversion policies has developed with the automobile industry on one side, the services on the other, and the War Production Board somewhere in the middle.

The automotive position, as enunciated in private and public by George Romney, director of the Automotive Council for War Production, is that basic policies, procedures and planning for reconversion must not only be made, but must be publicized as well. The nub of the ACWP attitude is that if workers feel that a comprehensive reconversion planning program is under way which will assure their ready transfer from war to civilian jobs, then the arms production program will progress more satisfactorily.

The Army and Navy viewpoint, however, is that talk of reconversion should be completely stifled. The services feel that anything which tends to remind workers that the end of the war is being planned will make them uneasy, more apt to quit war jobs and seek permanent posts, more ready to believe that the jobs on which they are working are no longer really important. This attitude is believed to have been forcefully expressed a few weeks ago when Lt. Gen. Brehon Somervell traveled quietly to the midwest to demand more war production.

The Automotive Council believes, however, that its viewpoint is gaining increasing favor in Washington,

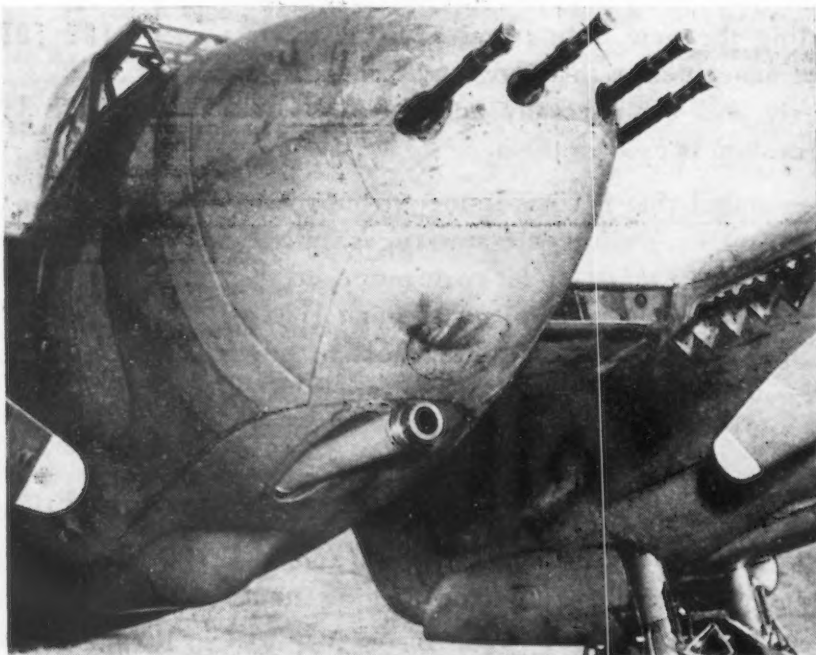
in part because administrative officials may be impressed by the argument that no matter how reconversion thinking is silenced, it will bob up in workers' minds again and again and again. Strength was lent to feeling that the Council is making an impression in Washington when last week-end's WPB elimination of spot authorizations in labor-tight areas authorized a modest amount of pre-conversion work necessary for the large-scale employing industries.

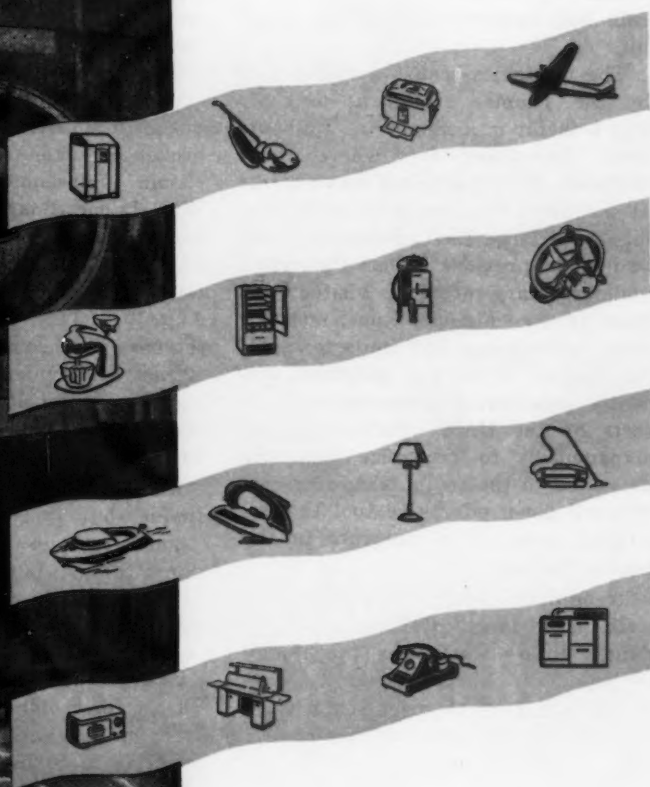
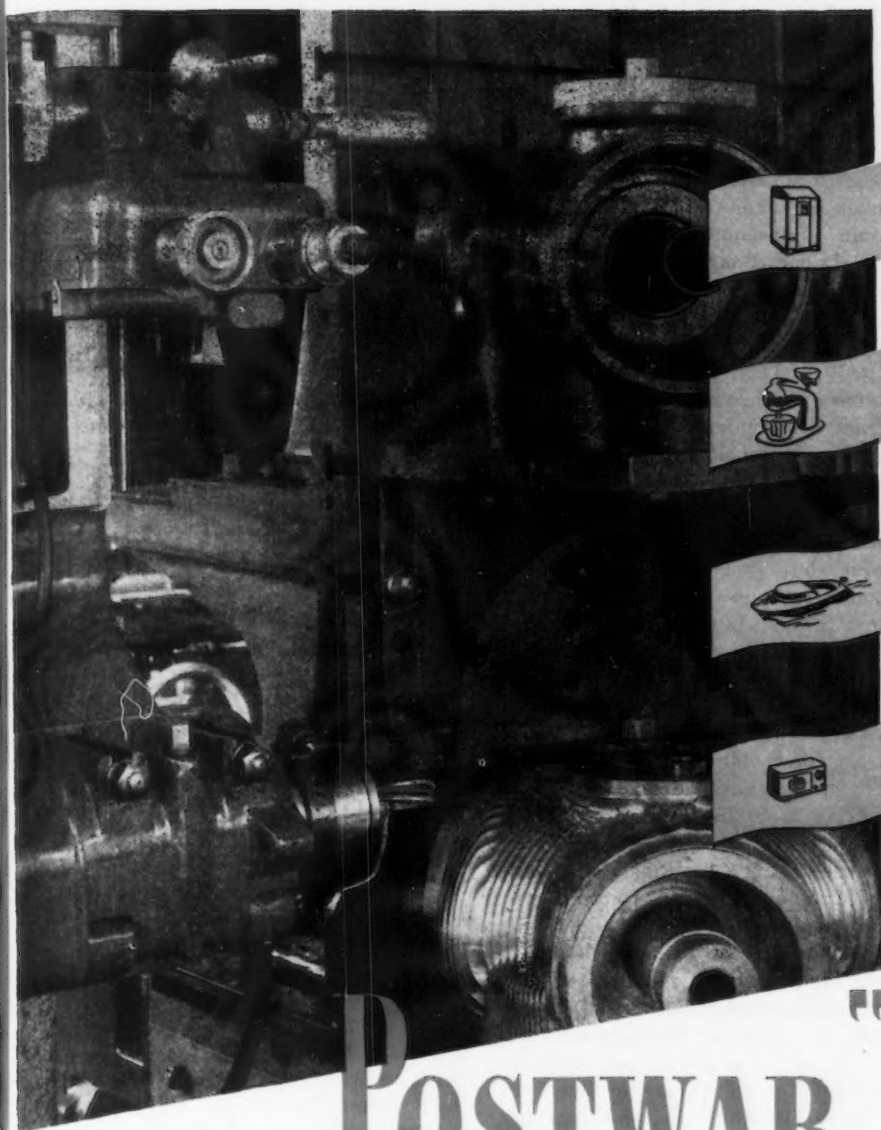
All of this leads up to reasonable curiosity as to the position of industry after European victory and before the end of the Pacific war. As a governing agency, WPB will be practically out of business, because the need for most of its restrictions will be ended and its personnel evaporated. Yet priorities of a sort will be necessary to assure the priority of Japanese war requirements. Who will administer these priorities? With the WPB only a shadow, the only agencies which will exist to rule and restrict will be the residual claimant agencies of WPB—which means mainly the Army and the Navy. These agencies, quite naturally, will want to be sure that nothing stands in their way toward adequate war supplies. The situation is one which may lead to more restrictions than industry would believe necessary along the reconversion road.

The reduction of worker requirements for war jobs led last week to a flurry of publicity on the matter, and an outbreak of somewhat related strikes in Detroit. R. J. Thomas, president of the United Auto Workers Union, started things off by declaring that employment in about a score of the largest metropolitan war plants had fallen an average of 24 per cent from their peaks. What evidently led to the Thomas statement was a rather substantial layoff at Packard, due to the fact that contracts there have now leveled out and are shrinking a bit, making possible the elimination of temporary help as output shakes down to a pattern. Complaints from the Packard local led to the definitely political Thomas statement, calling attention to layoffs all over Detroit, and demanding a 40-hr. week to alleviate the plight of the idle workers.

ACTUALLY, the 24 per cent figure of the union seems considerably overdrawn. In the first place, most of those laid off have gone into service. Second, no argument exists over the fact that in spite of layoffs—probably not more than 15 per cent below peak, rather than 24 per cent—there is still a shortage of manpower in Detroit, and jobs are waiting for those who want them. Worker evaporation is a fact here, as everywhere else; pay-

MOSQUITO STINGERS: *The Mosquito MK. XVIII carries four 0.303 machine guns and one 6 lb. cannon, fully automatic or single shot, with a firing rate of one per second.*





POSTWAR "PILOTS"

from the Machine with a "Brain"

This is the giant Keller—a machine whose mechanical “brain” and unerring touch are doing yeoman service in turning out vital war equipment. And it assumes an important new role as industry prepares for reconversion to civilian production.

To engineers and designers of postwar products it is proving invaluable in building pilot models and other experimental parts. New models — new inventions — can be developed for testing without expensive tooling and delay; without costly dies.

A wooden or plaster model or a plain template can be used to generate a model component out of

a solid billet or rough squared forging. The Keller's tracer follows the most intricate pattern . . . its cutters reproduce this identically in two or three dimensions. It works by itself . . . does its own "thinking" . . . maintains its own accuracy.

When assembled, these parts may form a purely experimental model . . . more than likely it will be a "pilot" model ready to lead the way down the production assembly line. The Pratt & Whitney Keller is one more example of a machine that needs no conversion . . . that gives *basic accuracy for mass production* day in and day out, war or peace.



PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT

rolls may be down but hardship is not up.

The uneasiness causing and caused by the Thomas statement probably was a factor in a number of walkouts here, there and everywhere about the town. Most publicized was a strike at the Cross Co., producers of special lathes for large shell production. Only two weeks previous Robert Patterson, undersecretary of war, visited this plant to urge higher output; and this visit, underlining the importance of the factory in the war program, evidently accelerated organizational efforts by the UAW. Refusal of the management to recognize the auto union led to the tieup, which directly weighed down efforts to tool the enlarging ammunition program in the heavier calibers.

Recognition was not involved as a strike issue in other shops. Graham-Paige Motors Corp. and the Dodge Division of Chrysler Corp. were struck in arguments over seniority, a consideration of growing importance as curtailments appear.

MORE significant was the tieup which broke out late in the week at the Mack Ave. plant of Briggs Mfg. Co., revolving around the status of supervisory help. The UAW action was taken on the claim that foremen were being demoted and given plantwide seniority, rather than departmental seniority on a one-year preferential basis. This was vigorously denied by Briggs.

The Foremen's Assn. of America, independent union, held back from action in the strikes, but joined the war of words. It charged that the company was trying to circumvent the FAA organizing program by designating assistant superintendents for general foremen's jobs, making the general foremen into departmental foremen, and putting the latter on production work. Men of long-term seniority were being put onto production jobs, it was claimed. The FAA chapter at Briggs began a counter-move against the designation of assistant superintendents for direct supervisory work by seeking to enlist them in the union; hitherto they were not qualified.

The foreman issue, potentially most explosive, was coming to a head on another front this week. Next Monday hearings are scheduled to start before the National Labor Relations Board in Detroit which may directly affect the determination in the Maryland Drydock case that supervisor unions are not eligible units for col-

lective bargaining under the Wagner Act.

Packard FAA Chapter No. 5 won a consent election about two years ago, but negotiations on recognition were broken off after the Drydock case decision. Subsequently the National War Labor Board took jurisdiction over the entire issue, and held a series of lengthy hearings last summer in Detroit and the east (THE IRON AGE, Aug. 10, 1944, p. 93). No decision has yet been forthcoming on the findings of fact, and evidently NLRB is not going to wait any longer. The Packard hearing is the first since the Maryland Drydock case.

Rehearing in such a situation is not unique, but it is unusual. The decision to take up the matter can mean many things, but the strongest inference is that some modification may have occurred in the board's thinking on foreman recognition. Certainly if it were unchanged, there would be no reason for holding the hearing. It might mean that the Drydock interpretation is to be limited in its application; it will be remembered that the case dealt particularly with the integration of supervisory employees, into a rank-and-file union, and in the Packard matter two unions definitely exist. And it can be recalled that before the Maryland Drydock case the board was on record to recognize foremen in soft coal mines, so there is precedent for its reversing itself on the issue. In any case, the hearings which begin at Detroit next Monday provide food for most serious contemplation by management, whose position all along has been that the ap-

pearance of foremen's unions in their plants would end their line of communication to the workers, and would put labor on both sides of the bargaining table in negotiations with the employers.

Chevrolet Production Of Aircraft Engines Goes on New Upswing

Buffalo

••• Chevrolet Aviation Engine Division's three Buffalo plants gradually will boost production of Pratt & Whitney motors during the next eight months to the peak level previously reached in November, 1943, according to General Manager Alfred G. Gulliver.

Rehiring of workers already is under way at all three plants, Mr. Gulliver said. When the peak is regained by next June, total employment will be approximately double the present figure.

The plants heretofore had laid off substantial numbers of workers, starting shortly after the beginning of this year, and operations of some departments had been brought almost to a standstill.

This trend has been reversed by orders of the AAF Technical Service Command for increased production of Pratt & Whitney R-2800s to power P-47 Thunderbolts and other aerial fighting craft.

The R-2800 is an 18-cylinder engine of more than 2000 horsepower and will roll from the same assembly line here that produced more than 60,000 of the P&W 1200-horsepower motors.

Several other large plants in the area are reported in line for sizeable new war orders and increased working schedules. As a consequence, WMC officials are predicting a manpower shortage that will dwarf anything that has been seen here to date.

The rebound is a blow to the hopes of labor leaders for an early ending of the controlled referral plan in Buffalo.

In fact, the WMC Labor-Management Committee is slated this week to reconsider previously rejected proposals to permit hiring of "foreign labor"—presumably natives of the West Indies—by local war plants to ease the pinch.

As a consequence of actual and pending developments, the near-term outlook for resumption of civilian goods production by various Buffalo plants appears exceedingly dubious.

COMING EVENTS

Dec. 6-8—National Association of Manufacturers, 49th Annual Congress of American Industry, New York.

Dec. 10-13—American Society of Refrigerating Engineers, 40th annual meeting, New York.

Jan. 8-12—SAE Annual War Engineering Meeting, Detroit.

Jan. 10-11—Institute of Scrap Iron & Steel, Inc., annual meeting, Cincinnati.

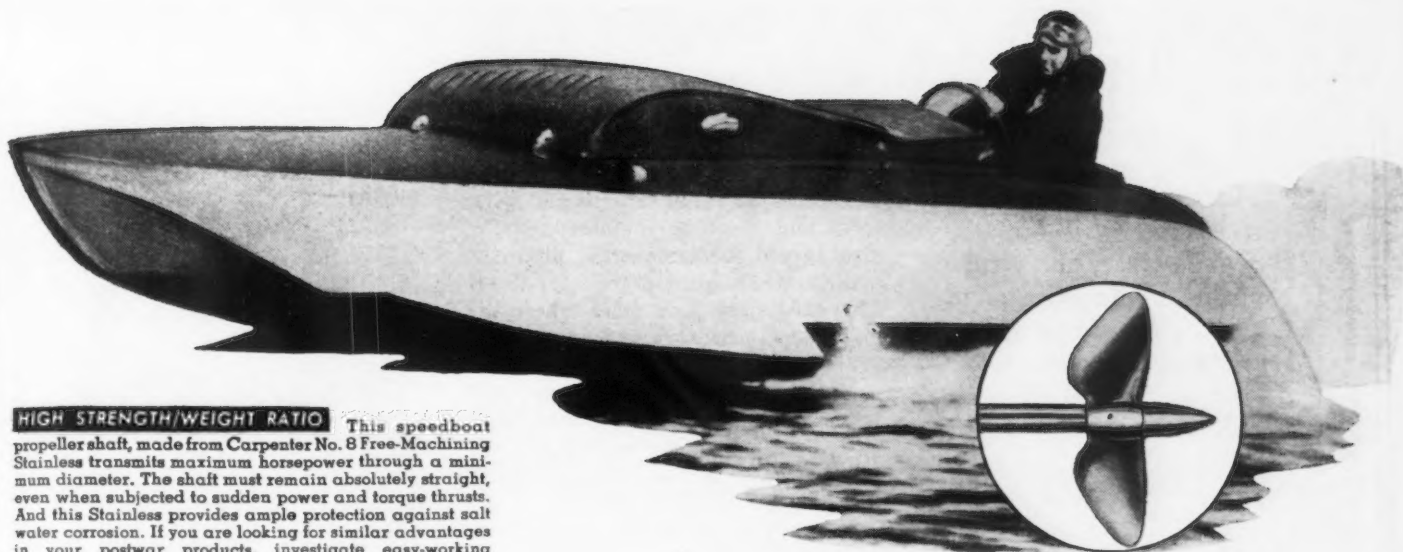
March 19-20—American Society of Tool Engineers, Cleveland.

March 19-22—Machine and Tool Progress Exposition, American Society of Tool Engineers, Cleveland.

April 4-6—SAE National Aeronautic Meeting, New York.

April 12-14—Electrochemical Society, Inc., Philadelphia—Atlantic City Congress, Atlantic City, N. J.

April 30-May 4—American Foundrymen's Association, Detroit.



HIGH STRENGTH/WEIGHT RATIO This speedboat propeller shaft, made from Carpenter No. 8 Free-Machining Stainless, transmits maximum horsepower through a minimum diameter. The shaft must remain absolutely straight, even when subjected to sudden power and torque thrusts. And this Stainless provides ample protection against salt water corrosion. If you are looking for similar advantages in your postwar products, investigate easy-working Carpenter Stainless Steels now!

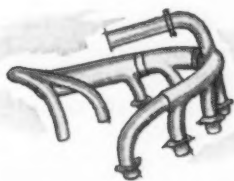
You get corrosion resistance, plus these...

SPECIAL PHYSICALS

with Carpenter Stainless Steels



WEAR RESISTANCE Stoker worms like this in thousands of homes and industrial plants can be installed and forgotten. Carpenter Stainless Steels Nos. 4 & 6 provide the wear and corrosion resistant qualities necessary to keep them constantly on the job.



HEAT RESISTANCE Carpenter Stainless No. 4-Ti or No. 4-Cb used in aircraft exhaust manifolds like that shown above, are typical of a variety of Stainless grades that meet specific high temperature service requirements.

Have you considered the many advantages that can be obtained for your new or redesigned products through the special physical properties provided by Carpenter Stainless Steels? Right here may be the answer to giving your postwar products greater utility, broader sales appeal.

Carpenter, as pioneer in the development of soft and ductile Stainless Strip and inventor of Free-Machining Stainless bar stock—has always made a specialty of producing Stainless Steels to do specific jobs. Our experienced representatives can help you select the Carpenter Stainless grades whose physical properties most fully meet your requirements. Careful laboratory control and exacting inspection assure uniformity, lot after lot, in the Stainless you receive.

Call in your nearby Carpenter representative now and take full advantage of his diversified experience in helping to get the best results with Stainless. But do it today, for planning time is getting short.

The Carpenter Steel Company, 121 W. Bern Street, Reading, Pa.

Carpenter STAINLESS STEELS



BRANCHES AT

Chicago, Cleveland, Detroit, Hartford,
St. Louis, Indianapolis, New York, Philadelphia



• Nation's steel bill to be raised \$77,500,000 by recent WLB wage awards, according to CIO . . . Average hourly rate will go to \$1.25 an hr. . . . Steel to seek relief.



WASHINGTON—If OPA were to give the steel industry an across-the-board price increase on all steel products, the agency could give weight to the retroactive features of the wage increase granted by WLB. But if it is decided that the only price increase is going to be on a product basis then the question of retroactivity is going to give a lot of trouble. There is a very good chance that any increase in steel prices will be on a product basis. This is some of the official thinking at OPA.

The recent grant by WLB, including vacations, intra-plant inequities and shift differentials will amount to about a 7c. an hr. increase according to Board officials, but about 8c., according to USWA President Philip Murray. This increase will raise the nation's steel bill approximately \$74,000,000 or \$1.15 for each ton of finished steel, based upon 65,000,000 tons of finished steel produced this year, as estimated by WPB.

The CIO estimate would make the award cost about \$77,500,000 and would raise the steel industry average hourly wage from the figure of \$1.17 an hr., given by the American Iron and Steel Institute to \$1.25 an hr. on the average.

Before when OPA thought of adjusting product prices to make up for increases in the cost of labor, the principle of compensatory adjustment was advanced. Compensatory adjustment was explained last April as a theory whereby one price movement is counterbalanced by the other.

At that time, it was proposed that

the prices of rails, structurals, bars, strip and sheet be increased. OPA also agreed to increase the prices of maximum analysis extras for SAE 3100-4100 steels to a point where the maximum prices approximate the prices for corresponding NE steels.

Maximum analysis extras for NE steels of the 8600-8700 series were to be decreased along with prices for rolled armor plate, propeller blade steel and for bullet core steel. At that time it was assumed that any price increase granted would make up for any retroactive grants made by WLB.

Prices were to be upped on those grades of steel which will be suitable for peacetime uses and pushed down on "war babies." Steel company arguments for price increases were: (1) costs have gone up because of the 48 hr. work week and its time-and-a-half overtime pay; (2) portal to portal pay to coal miners; (3) the adjustment granted by the award under the Little Steel formula; (4) the necessity of hiring green workers and power in the mills which have proved to be less efficient; and (5) net income has been reduced by increased demands for products which are less profitable.

Negotiations for price increases were dropped by mutual consent because it was thought that any award might prejudice the steel wage case at a time when the government was most anxious to maintain the stabilization program. At present, there is no proposal to increase prices before OPA although steel industry

Ed. Note: Steel men are now in the process of preparing a petition for price relief.

spokesmen have recently said that the WLB decisions will make it necessary for OPA to grant the industry some kind of price relief.

On the other hand, there are those in OPA who are expected to oppose an increase in steel product prices. Some government officials outside OPA are wondering what weight will be given to the secret Gilbert report which concluded that the companies could bear the entire 17c. increase proposed by the union without increasing steel prices.

If OPA should find that some price increases are justified, then Economic Stabilizer Fred M. Vinson must decide whether the wage revisions should



SURPLUS DISPOSER: *Former Governor Robert A. Hurley, of Connecticut, was nominated by President Roosevelt as a member of the Surplus Property Disposal Board.*

be allowed regardless. This is established procedure.

WLB Chairman William H. Davis said that he would be "very much surprised if there would be any general price increase as a result of the board's action."

Asked where steel producers might obtain money to pay the wage increases, Mr. Davis gave a one-word answer.

"Profit" he said, but later added that the elimination of wage inequities should result in increased production efficiency which in turn would further hike profits.

* * *

WPB officials now say that the 40 per cent cut in the Army supply program which was expected after X-Day and extensively discussed by all government officials may be as little as one-half of this or about 20 per cent. Still other officials say that it may be that nothing will be cut from the program after the defeat of the Germans.

In this event it would be reasonable to say that the most industry could hope for after X-Day would be an expanded spot authorization plan. But WPB has not received the revised War Department figures yet, and responsible officials say that it is too early to definitely state whether the arms slash will only be 50 per cent

Syndolag

RICE-SIZE CLINKERED DOLOMITE
FOR THE ELECTRIC FURNACE



...Saves Fetting Time, Reduces
Repairs, Lowers Refractory Costs

● Efficient, economical fettling of an electric furnace calls for a smaller-sized refractory than the standard open hearth clinkered dolomite. Syndolag was designed to meet that need. It is a rice-size material, of sharp angled grains, carefully proportioned as to size and free of fines.

Since its introduction in the rice-size two years ago, Syndolag has grown steadily in favor in electric furnace shops. Operators who use it like it for these unique properties:

1. Sharp angle of repose—The small, angular grains stay in place well on steep slopes, instead of rolling down the banks to pile up around the edges of the flat. This cuts down fettling time, reduces refractory consumption and protects the capacity of the furnace.

2. Rapid heat absorption—Small

grains absorb heat more quickly than larger grained material. This is especially important in the electric furnace where only residual heat after tapping is available to set a refractory.

3. Quick consolidation—Syndolag's small grains set up quickly into a dense, homogeneous patch which does not cut out readily or loosen easily—a valuable asset for top charged furnaces.

Syndolag has the same desirable chemical and mineralogical properties that have made

Magnefer so successful for open hearth maintenance. Both refractories are produced at our modern plant in Northwestern Ohio, located near the geographical center of the steel industry. Adequate stocks are maintained, so that we can take care of your immediate needs with prompt rail shipments.



BASIC REFRACTORIES, INCORPORATED *Cleveland, Ohio*

of the original estimates in September and October.

It may be that the Army is digging in for a long European war and figuring it will extend beyond the middle of next year and also anticipating a hard siege against the Japanese in China whose positions must be heavily consolidated by this time. Whatever the outcome, war agencies are driving now to get the last ounce of production effort from labor and management.

* * *

The American Political Science Association through its chairman, Dr. George B. Galloway, recently submitted recommendations for the streamlining of Congress on the basis of things a survey showed Congressmen think is wrong with the legislative process.

The Association found that the following criticisms were common:

1. Congress is overburdened by many matters which divert its attention from national policymaking and which it ought not to have to consider, such as private claims and pensions, the government of the District of Columbia, and other time-consuming local details.
2. The members and committees of Congress lack adequate, independent, technical staff facilities to help them perform their duties efficiently.
3. There are too many committees

with overlapping jurisdictions, especially in the Senate, where members have too many committee assignments.

4. Responsibility for the development and coordination of legislative policy is scattered among various offices and committees of Congress.

5. Channels of communication with the Executive Branch are inadequately developed, making teamwork between them difficult.

6. Congress lacks adequate facilities for the continuous inspection and review of administrative action.

7. The distribution of power, espe-

cially in the House, needs to be modified.

Congress has always been shy of appropriating money to improve its operating machinery because of a fear of criticism by the electorate that members are guilty of unnecessary squandering of the taxpayer's money. This line has been followed so long that Congressional timidity has resulted in the thing the legislative branch has dreaded, a waste of taxpayer's money because of the inefficiency of Congressional organization and a fundamental lack of technical skill to carry on the nation's business.

Oil Industry Building Restriction Relaxed

Washington

• • • WPB has eliminated from Preference Rating Order P-98-b restrictions on the use of steel plate, metal lath, aluminum and hardware for construction operations in the oil industry covered by PAW Form 30. Restrictions also were relaxed on the use of steel sheet, steel strip, rails and craneways and copper-base alloys for Form 30 operations. The revised schedule likewise permits the use of materials in electrical work for most purposes.

Changes in construction standards, as incorporated in the revised schedule, represent a relisting of recent changes in WPB's materials controls into a single document for the convenience of the petroleum industry, it was pointed out by PAW upon whose recommendation the schedule was revised.

Tools Up 3.4 Per Cent

Washington

• • • Representing an increase of 3.4 per cent or \$1,224,000, October machine tool shipments by 199 firms were valued at \$37,133,000, compared with \$35,889,000 in September, the WPB Tools Division has announced.

Net new firm orders (total orders less cancellations) received by the firms totaled \$56,521,000, an increase of \$23,369,000, or 70.5 per cent, over September's figures. The backlog of unfilled orders increased to \$213,392,000 in October, or 9.9 per cent over September. About \$25,716,400 represented by unrated orders. At the present rate of shipments, approximately six months will be required to fill orders on hand as of the end of October, WPB said.

New Tin Plate Quota Set

Washington

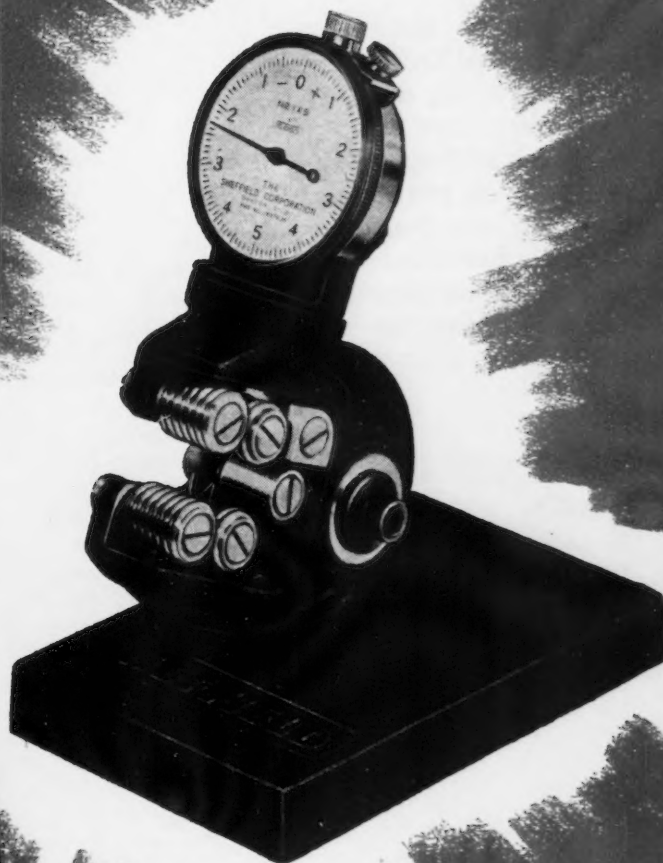
• • • Members of the Tin Plate Industry Advisory Committee at a recent meeting were informed by WPB officials that tin plate production for the first quarter of 1945 had been set at 900,000 tons, of which approximately 150,000 tons will be earmarked for export. The first quarter schedule exceeds by 125,000 tons the 1944 fourth quarter quota. Committee members, it was stated, concurred with WPB plans to continue restricted use of tin for an indefinite period as a conservation measure.

THE BULL OF THE WOODS

BY J. R. WILLIAMS



**Critical
Thread Elements
*Specifically
Revealed*
IN ONE PASS**



The Sheffield THREDCHEK provides a more specific and accurate check of critical thread elements than the conventional collective check.

Two GO rolls serve to pass parts that are not oversize and which will assemble. These rolls screen out parts which are oversize or which will not assemble because of an excessive error or combination of such errors in lead, angle and pitch diameter.

As the parts are passed from the GO or assembly rolls and are presented to the two NOT GO rolls, one of which is mounted so as to actuate a dial indicator, the dial shows whether the pitch diameter is too small and by how much. Should the pitch diameter show as being within tolerance limits and near basic, then it can be assumed that lead and angle are not only within tolerance limits but

are also of the highest dimensional quality.

A free-rotating backstop enables the part to be properly located for accurate checking and also permits checking for out-of-round. The backstop, together with the indicator, eliminates the need for a trained sense of "feel" in making the NOT GO check—a most important advantage of the THREDCHEK.

Both sets of rolls are PRECISIONPLATE—Sheffield precision chrome plate—for longer life. Full manufacturing tolerances may be utilized because wear allowance is compensated by adjusting the rolls on their eccentric axis. The open end style permits checking close to a shoulder.

THREDCHEKS are available in frame sizes corresponding closely to Sheffield Thread Roll-Snap Gages, with standard or special pitch rolls. Write for engineering data "Instruments #8".

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West Coast . . .

OSGOOD MURDOCK

• "It's a grease spot" suggests General Knudsen as horse racing distracts war workers on the hard pressed Pacific frontier . . . War plants committee of southern California business men will expedite purchase and postwar operation of 31 war plants.



LOS ANGELES—"It's neither a black spot nor a white spot. It's a grease spot. It's slipping," commented Three-Star Lt. Gen. William S. Knudsen when he dropped into southern California by plane last week in his plodding, implacable rounds as director of world wide Air Technical Service Command.

He was here to see what he could do to jack up war workers on the Pacific Coast and particularly in the Pacific Southwest. He was upset as are other top officials of the many Federal agencies concerned with manpower and war production. It was disquieting to him that so many workers were so keen about the deer season, the duck season and the pheasant season. He didn't like the idea of the resumption of horse racing at Hollywood Park.

Increased production of B-29 Superfortress bombers seems to be at the top of the list, and more than 50 subcontractors are in the Los Angeles area. America will produce 100,000 military planes this year, he stated, and the 1945 program calls for 75,000. Although that is fewer ships, the production poundage will be as great or greater.

Disclosure and publication of the total number of wage earners in the aircraft and shipbuilding industries of California has recently been authorized, and realization of the mushroom

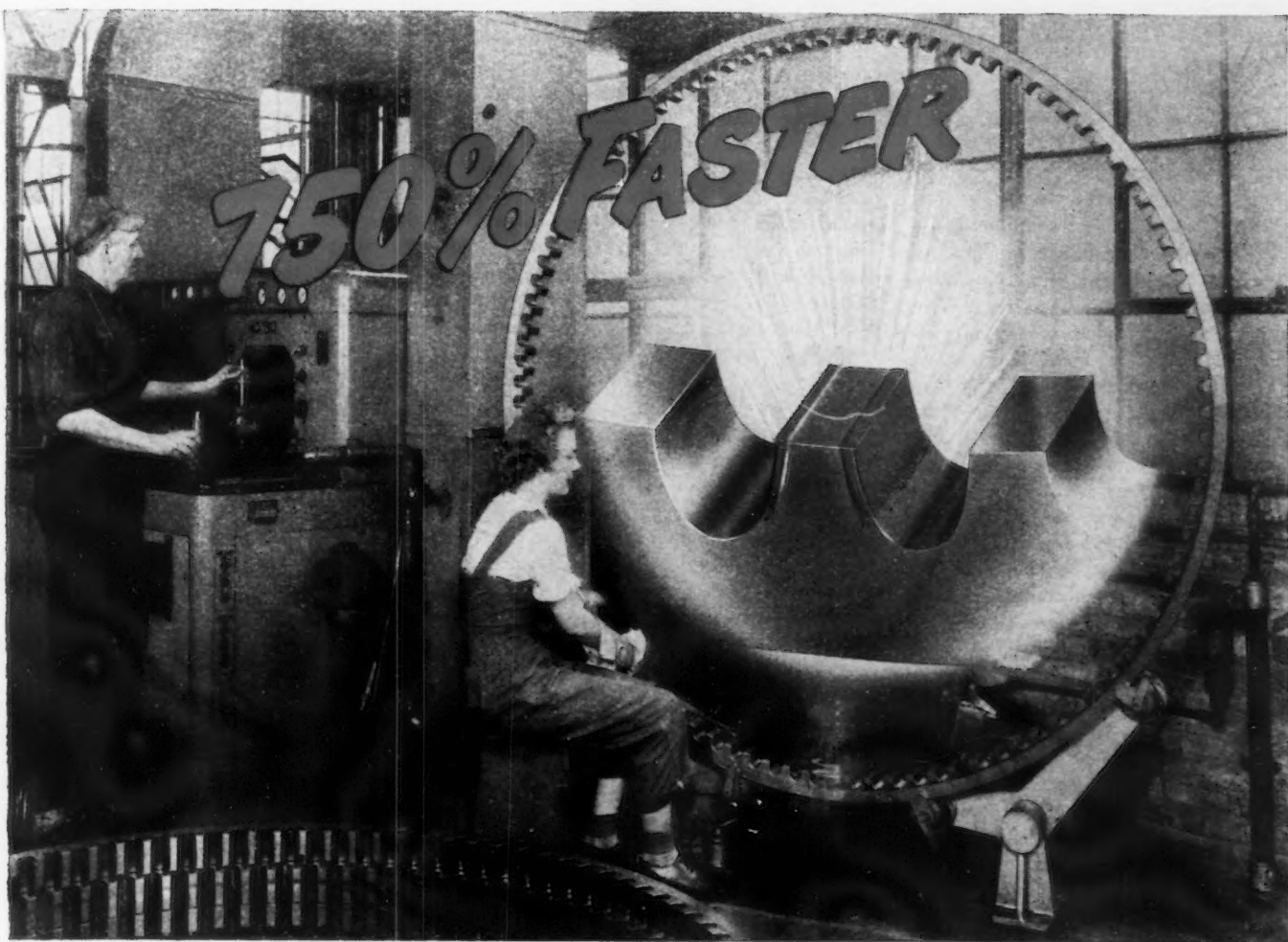
growth in part accounts for the present irresponsible decline and outmigration of workers. Exclusive of government yards and clerical, supervisory, technical, executive and specialized personnel, there were only 15,000 employees in aircraft plants in southern California in 1939, only 800 employed in shipbuilding plants. In the San Francisco area the same year, 3000 were engaged in shipbuilding. In 1943, when peak employment in aircraft was reached in August, there were 199,000 aircraft workers and last December at shipbuilding's southern California peak there were 87,600 shipbuilders. In the San Francisco area the peak came in June, 1943, with 185,200 employees in shipbuilding. The decrease between the peak months of 1943 and October, 1944, has been 34.8 per cent in aircraft and 13.7 per cent in shipbuilding. There are now approximately 129,800 aircraft workers in southern California and 75,600 shipbuilders. In the San Francisco area 142,000 are still credited to shipbuilding, but including the two major government yards on San Francisco Bay (Mare Island and Hunters Point) there are probably 200,000 shipbuilders at present employed in that area. Including clerical, sales, construction, executive and

technical personnel, it is estimated by the State Division of Labor Statistics and Law Enforcement that 1,029,000 persons were employed in all manufacturing plants in California in October, 1944, compared with 1,061,000 the previous month and 1,168,000 in October, 1943.

COMMENTING significantly on this situation, the current monthly review of the Federal Reserve Bank for the 12th District points out that the decrease in aircraft and shipbuilding employment has occurred in the face of renewed demands by these industries for more workers. "In fact, virtually every important establishment in the area is actively attempting to recruit new employees at the present time. Apparently other factors, such as optimism regarding an early end of the war and fear of a reconversion lag in the West, are outweighing opportunities to remain in war jobs. People are leaving the five principal Pacific Coast production areas in substantial numbers, many of them presumably to return to home states outside the 12th District. Additional factors in the decline of employment in the principal durable goods industries have been the return of housewives and older persons to

WORLD'S FASTEST: Bearing the insignia of the Chinese Air Force, these P-51 Mustangs rolling off North American Aviation's assembly lines are allocated to China by the U. S. Army Air Forces to be flown into combat by Chinese pilots.





TOCCO *LOCALIZED* HARDENING keeps an 82" diameter accurate within 1/1000"

HERE is the report on Northern Pump Company's development of the TOCCO-hardening of gun training gears:

The 82" ring gear shown above is TOCCO-hardened, one tooth at a time. In just 4 seconds, high frequency induction brings the 3" wide wearing surface of the tooth to 1540° F. TOCCO's integral water-quench then instantly cools and hardens it. Handling and tooth indexing are all automatic. The 103 teeth of the gear are TOCCO-hardened in less than 18 minutes . . . 750% faster than the 2¼ hrs. required by the former method.

Heating and cooling in this rapid way . . . confined to a small section of the whole part . . . reduces distortion to a negligible amount. Variation in the total 82" diameter, due to hardening, is only $\pm .001$ " or less. Rejects have been eliminated. The wearing surface of every tooth is hardened to 45-47 R.C., and the original ductility of the outer ring is retained.

The uniformity and speed of TOCCO Induction Hardening can be a powerful ally of yours in tomorrow's struggle for more saleable products and lower costs. Enlist a TOCCO Engineer in your heat-treating planning now.

THE OHIO CRANKSHAFT COMPANY • Cleveland 1, Ohio



TOCCO

INDUCTION
HARDENING . . BRAZING
ANNEALING . . HEATING

non-employment pursuits, and the shift of workers to so-called civilian goods industries. With regard to the latter point, preliminary reports indicate some recent growth in the number of small retail establishments."

Apparently the profit motive and financial inducement is no longer an incentive, particularly to those from interior points or from agricultural, household or non-industrial sources who have donned the helmet and jeans of a war worker and are now either weary or well rewarded. In October average hourly earnings for aircraft and parts workers in California were \$1.218 per hr. and for shipbuilding and repairing \$1.460 per hr. Average weekly earnings were \$56.32 in aircraft and \$72.75 in shipbuilding. Average hours per week were 46.2 in aircraft and 49.8 in shipbuilding compared with 44.6 and 44.4 in these respective industries a year ago.

Very active recruiting is being conducted for aircraft, shipbuilding and munitions plants. Just last week 450 Navy families adjacent to a landing force equipment depot at Albany were given only a few weeks' notice to evacuate in order to accommodate the families of new workers for the Mare Island Navy Yard.

A CONSTRUCTIVE, coordinated economic area approach to big scale conversion and postwar industry prospects is involved in the formation of a Government Plant Committee by the general industrial committee of the Los Angeles Chamber of Commerce. The new Government Plant Committee has for its particular project the disposal of 31 government owned factories with a total valuation of \$150,000,000 in the southern California area. Members and representatives of the committee will first contact present operators of the plants and then other manufacturers throughout the United States in the hope of promoting and integrating peacetime industry, especially in view of research and surveys to determine what consumer or industrial items may be produced with least possible reconversion detail and with best chances of future markets. George J. Buckley of Ford J. Twaits Co. (general contractors) is chairman and Howard Brown of the Henry J. Kaiser Co., Inc.; F. S. Carpenter, U. S. Rubber Co.; A. D. Bragg, General Electric Co.; John R. Holt, banker, and O. K. Buck of the Municipal Bureau of Power and Light are other members of the committee.

Persistently the starry-eyed advocates of future West Coast industry, and particularly the Chamber of Commerce and Federal, state and municipal bureau promoters, delight in pointing out the low per capita production record of the West Coast compared with per capita consumption. These delightful statisticians would doubtless claim that as many dollars should be printed or minted west of the Rocky Mountains as are cleared through its banks, in proportion to national totals. For instance, they point out that the far West in 1939 purchased 3½ per cent of all radios but made only 1½ per cent, purchased 15 per cent of stoves, ranges and heaters and produced only 8.2 per cent, bought 14.4 per cent of builders' hardware and produced only 2.6 per cent, consumed 14½ per cent of farm implements and machinery and built only 1.3 per cent, used 10.8 per cent of electrical products and made only 2 per cent. If this reasoning is extended to the steel and automobile industry, Pittsburgh and Detroit find themselves split up and spread around like the pork barrel appropriations in the Rivers and Harbors Bill.

Yet the promise and probability of a considerable general postwar advance in heavy industry along the West Coast continues to improve. Within the last few weeks, Admiral Royal E. Ingersoll has taken up his headquarters at San Francisco as commander of the Western Sea Frontier, deputy chief of naval operations and deputy commander-in-chief of the U. S. Fleet. He has publicly predicted that all industrial plants on the

Pacific Coast will be going full blast for at least a year after the cessation of hostilities with Japan to take care of the tremendous job of reconversion of Navy transports into commercial vessels and to man and maintain navy supply depots, magazines and air stations to complete the general repair and overhaul of the fleet and aircraft. Recently arrived from the Atlantic area, he has stated here that naval requirements in that area are definitely "on the wane" and he favors postwar retention of bases in the Pacific and facilities so that "our Fleet can strike anywhere from any place in the Pacific without loss of time."

Major war industries in the West represent, not converted peacetime industry, but new war facilities not readily adaptable to civilian goods production in many cases. Ultimate transition from a wartime to a peacetime economy, therefore, does not concern a return of facilities to pre-war uses so much as the development of new products and new markets to maintain employment after a level sufficient to engage the large wartime increase in population. Preliminary surveys of in-migrants indicate that only 20 per cent expect to leave the area and from one-third to one-half expect to remain. One-third of former housewives plan to continue working, preferably in industrial employment. Moreover, it is anticipated that 900,000 persons who have joined the armed forces since 1940 will more than overbalance the number who will leave the area or retire from the labor force.

Ammunition Reworking In Midwest Ordnance Plant After the War *Ravenna, Ohio*

• • • Probably Ohio's most unusual post-European-war industry, and one with loud repercussions, is expected to be the reconditioning of ammunition at the Ravenna Ordnance plant, now operated by Atlas Powder Co.

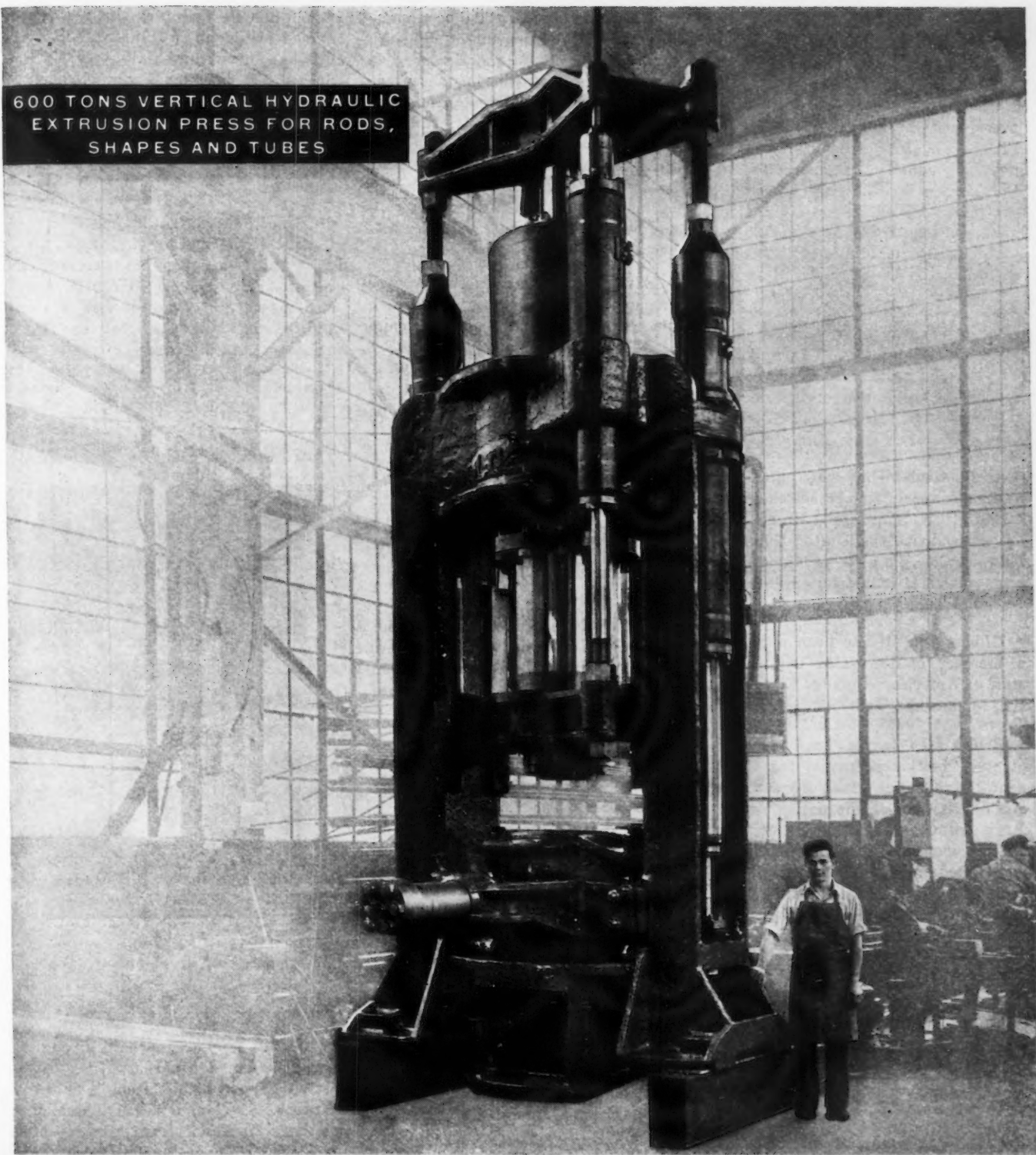
Present plans include the Ravenna works as one of the facilities which will "screen" ammunition returned from theaters of war and rework all of it worth saving. Types to be reconditioned here will include bombs, shell, land mines, and demolition blocks.

Armies are furnished ample am-

munition quotas, if available, and sometimes much is left over, exposed to the hazards of weather, handling, and war, and cannot be sent to battle-front without some examination as to its usefulness.

At present, this work is being done mainly at ammunition dumps behind the front, although some ships are said to be returning with shell as ballast. Much of the ammunition returned is found to be serviceable as is, but some has to have major or minor work done on it, and it is possible that the equipment at Ravenna will be diversified, with the addition of machinery for semi-manufacturing operations on fuses and shell. Meanwhile, until the end of the war with Japan, the Ravenna Works will be used for shell loading.

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PERSONALS

• **John P. Roche**, assistant to the president, Oliver Iron & Steel Corp., Pittsburgh, has recently been appointed industry member, National War Labor Board, Washington. For the past year and a half, Mr. Roche has served as an industry member of the Third Regional War Labor Board at Philadelphia.

• **Harry W. Hahn** has been appointed vice-president in charge of engineering and production, H. L. Harvill Mfg. Co., Vernon, Calif. Mr. Hahn recently has been plant manager of Die Cast Corp.-Warner Mfg. Co., Glendale, Calif.

• **I. B. Gruber** has been appointed general superintendent of the Sawhill Mfg. Co., Sharon, Pa. He has been associated with the United Tube Co., Ellwood City, Pa., and previously was assistant chief industrial engineer for National Tube Co., Pittsburgh.

• **Gilbert D. Dill** has been appointed a member of the sales engineering staff of American Foundry Equipment Co., Mishawaka, Ind.

• **Ernest G. Jarvis** has been appointed chief metallurgist for Continental Industries, Inc., New York. Mr. Jarvis, one of the nation's ranking metallurgists and alloy specialists and president of Niagara Falls Smelting & Refining Corp., will be advisor and research director to this small business group. Mr. Jarvis is the author of "Facts for Foundrymen."

ERNEST G. JARVIS, chief metallurgist, Continental Industries, Inc.



• **Hugh A. Holmberg** has been named director of procurement by Bell Aircraft Corp., Buffalo. He succeeds **Norman T. Shaw**, who has accepted a new post with the Ryan Aeronautical Co., San Diego, Calif. Mr. Holmberg formerly was purchasing agent for Bell. **Robert A. Gaffney** has been appointed associate director of labor relations for Bell. Until recently he had been on active duty with the AAF overseas as a lieutenant colonel.

• **Edward Stokvis**, executive vice-president of R. S. Stokvis & Sons, Inc., New York, and general manager of N. V. Handelsmaatschappij R. S. Stokvis & Zonen, Curacao, N. W. I., has become a member of the board of directors of the Colonial Trust Company, New York.

• **Harold Martin**, manager of merchant product sales at Boston since March, 1942, has been appointed assistant manager of New England sales by the American Steel & Wire Co., U. S. Steel subsidiary.

• **Racy D. Bennett** has resigned as manager of the Hydraulic Division, Vinco Corp., Detroit, to establish an office next January, as consulting engineer in or near Los Angeles, Calif.

• **Dr. Roger H. Lueck**, formerly connected with the American Can Co.'s Pacific division, will return there December 1 to assume duties as manager of sales. Dr. Lueck goes to San Francisco from the general sales department in New York where he has been active in postwar planning projects.

• **Carroll F. Powell** has joined the staff of Battelle Institute, Columbus, Ohio, where he will be engaged in research in nonferrous metallurgy. Mr. Powell was formerly associated with Basic Magnesium, Inc., Las Vegas, Nev.

• **Harold J. B. Thompson** has joined Lukers Steel Co. and its divisions, By-Products Steel Corp. and Lukenweld, Inc., as manager of real estate.

• **L. S. Stilwell** has been named branch manager of the Cleveland sales office, Western Automatic Machine Screw Co., Elyria, Ohio. He replaces **W. W. Kimbrough**, who has been made branch manager of the Detroit office and warehouse.

• **S. E. Gane** has resigned from the Gould Storage Battery Corp.'s sales staff to organize the S. E. Gane & Co., manufacturer's agent for mining industry supplies. Mr. Gane was Gould's divisional sales manager in Pittsburgh for the past seven years.

• **William P. McGervey, Jr.**, has been named president of Hanford Foundry Co., San Bernardino, Calif. **Arnold K. Steger** has been made vice-president, and **Maurice W. Cardwell**, secretary and treasurer. All three were formerly with Warman Steel Casting Co., Los Angeles.

• **Clarence E. Bleicher**, former vice-president and general manager of the DeSoto Division, Chrysler Corp., Detroit, has been appointed president of DeSoto. He succeeds **Byron C. Foy**, who has been on overseas war service and is resuming his post as vice-president and director.

• **Burton F. Davis**, formerly associated with Van Sant, Dugdale & Co., has joined the sales department of Rheem Research Products, Inc., Baltimore.



PAUL M. MUELLER, chief engineer in charge of development, Blaw-Knox Co.

• **Paul M. Mueller**, mechanical engineer, has joined the Blaw-Knox Co., Pittsburgh, as chief engineer in charge of development. Mr. Mueller has been headquarters engineer for the Revere Copper & Brass Co. for the past nine years, assisting in the design of a brass mill and magnesium sheet and extrusion mills. In 1926 he was with the Hartford Machine Screw Co. as superintendent. Mr. Mueller joined the General Cable Co., Rome, N. Y., in 1929, as central office engineer, where he designed several wire drawing machines and stranding methods, and the plant and equipment for Boulder Dam power cable.

• **J. F. McBride** has been appointed sales manager of the Range Division, General Electric Co., Bridgeport, Conn., effective January 1, 1945.



CHARLES T. SCHWAB, general superintendent, McLouth Steel Corp.

- **Charles T. Schwab** has been appointed general superintendent of the McLouth Steel Corp., Detroit, succeeding **Ivor Bryn**, who recently was named vice-president in charge of manufacturing. Mr. Schwab had been superintendent of the Stainless Steel Division of the Gary sheet and tin mills, Carnegie-Illinois Steel Corp., since 1940. Previously, he had served for three years as assistant to the vice-president of the American Steel & Wire Co., a U. S. Steel subsidiary.
- **Clifford W. Johnson** has been appointed sales representative in Connecticut for the Storage Battery Division, Philco Corp., Trenton, N. J.
- **Dr. Paul W. Leppla**, formerly chief chemist of the Research Division, Cardox Corp., Chicago, has been placed in charge of the company's electrochemical activities. **Dr. John L. Gring** succeeds Dr. Leppla as chief chemist.
- **Clyde C. Sowards** having been relieved of active duty as a captain in the U. S. Army, has returned to the Copperweld Steel Co., Glassport, Pa., to resume his duties as representative in the South Atlantic states.
- **George Krieger**, who has been in charge of the WPB Farm Machinery Division and recently special assistant to Donald M. Nelson, has resigned to return to the Ethyl Corp., New York. Before joining WPB in 1942, Mr. Krieger was head of the Agricultural Division of Ethyl's technical service department.
- **C. E. Scholl** has been made general manager of Federal Electric Products Co., Inc., Newark, N. J.

• **L. J. Karmen** has been appointed director of administration, Manufacturing Division, Crosley Corp., Cincinnati; **E. C. Brode** has been appointed manager of distribution of the same division.

• **P. S. Dickey** has been appointed chief engineer and **H. H. Gorrie**, assistant chief engineer, Bailey Meter Co., Cleveland. **R. E. Clark** has been made manager of contract engineering.

• **H. R. Pittman** has been appointed treasurer, Vulcan Iron Works, Wilkes-Barre, Pa., following the resignation of **W. W. Moss**. Mr. Pittman has been connected with the company for 27 years.

• **R. N. Armstrong** has joined the Pittsburgh sales force of **A. Milne & Co.**, New York. He was previously with the Jessop Steel Co., Washington, Pa., and prior to that with the British Purchasing Mission, Washington, D. C.

• **Frederick H. Ruff** has been appointed controller, Jessop Steel Co., Washington, Pa. Mr. Ruff was recently associated with Universal Cyclops Steel Corp. and prior to that with Jones & Laughlin Steel Corp.

• **Col. Bryant L. Boatner** has been named acting chief of the Procurement Division, Air Technical Service Command, Wright Field, Ohio, serving in behalf of Brig. Gen. Orval R. Cook, chief of the Procurement Division, who is away temporarily on a special mission. **Col. Horace A. Shepard** has been named acting chief of the production section in the Procurement Division, which is in addition to his duties as chief of the Procurement Division's control section. **Col. Shepard** succeeds **Col. George E. Price**, who has left Wright Field on an undisclosed mission.



ARCH A. WARNER, newly elected president and general manager, Rockford Drilling Machine Division, Borg-Warner Corp.

- **E. H. Branning** has joined the Wood Shovel & Tool Co., Piqua, Ohio, as general manager. Mr. Branning has just resigned as head of the Hardware and Tools Procurement Division of the Army Service Forces.
- **Richard B. Jenkins**, formerly general manager and director of sales of the Plumbingware Division of Briggs Mfg. Co., Detroit, has been named general manager.
- **Herman Menck**, vice-president in charge of manufacturing, Harnischfeger Corp., Milwaukee, and **I. R. Wagner**, president and general manager, Electric Steel Castings Co., Indianapolis, has been elected president and vice-president, respectively, of the National Founders Association, Chicago.
- **George D. Moomaw** has been elected a director of Rustless Iron & Steel Corp., Baltimore. Mr. Moomaw is vice-president in charge of operations.

OBITUARY...

- **Beverly Sneed**, 71, vice-president in charge of sales, Virginia Bridge Co., Roanoke, Va., died November 27 in Washington. Mr. Sneed, who had been recalled from retirement, due to wartime pressure of business, had served Virginia Bridge for 43 years.
- **William T. Hedlund**, 45, president of the Elastic Stop Nut Corp., Union, N. J., died at his home in Summit, N. J., November 29. Mr. Hedlund had been president of the corporation since Sept. 1, 1942, after serving as vice-chairman of the board of direc-

tors for a month and as director since January, 1941. From 1936 to 1942, he was a vice-president of the Electrolux Corp.

- **Charles S. J. MacNeil**, 34, chief engineer of Aeroproducts Division, General Motors Corp., at Dayton, died of a heart attack November 18. Mr. MacNeil, co-inventor of the Aeroproducts automatic, constant speed propeller, was recognized, despite his youth, as one of the foremost propeller authorities in the country.
- **Howard Gay**, 51, secretary and Cost Department manager of Macwhyte Co., Kenosha, Wis., died November 23.

Fatigue Cracks . . .

BY A. H. DIX

"Dear Mr. Anthony"

• • • Our neighboring feature, "Dear Editor," two pages toward your right hand, is edited by John Anthony of the brains department. As readers' problems are sometimes solved on that page, we are trying to induce the pres. and ed. dir. to change the heading to "Dear Mr. Anthony," with "My problem is . . ." as a subhead.

Sun Never Sets . . .

• • • If you turn to pages 111-112 of the December *Reader's Digest*, you will find this paragraph in a condensation of William L. White's "Report on the Russians."

The next morning Kirilov arrives to take us to the factory where they make the Soviet Union's automobiles . . . The director tells us with quiet pride that he has visited American factories at Detroit, Flint, Saginaw . . . that he is a member of the Society of Automotive Engineers and a subscriber to "Iron Age".

Redhead Status Quo Unchanged

• • • The paragraph about our Mr. Anthony will be meaningless to the director of the Soviet automobile plant unless we explain that the phrase "Mr. Anthony, my problem . . ." introduces true tales of domestic woe poured each Sunday night into the ears of John J. Anthony, who attempts to weld, via his radio "Court of Human Relations," rents in marital ships.

The radio's Mr. Anthony has become a stock figure of fun because he is singularly unsuccessful in the admittedly difficult job he has cut out for himself. The lady with five children, asthma, and a husband who left her to live with a redhead in Oak Park is seldom any better off when she goes off the air than when she went on it, for Mr. Anthony is a practitioner of the let-nature-take-its-course school, which means that the lady still has her five children and asthma, and the husband still has his redhead.

Under the radio's Mr. Anthony's unerring touch, domestic problems are converted from the merely desperate to the positively hopeless. It is as if a person with arthritic hands aspired to juggle crockery. But our Mr. Anthony's touch is deft and sure, for he taps the collective cerebrum of the brains department, and if you or the director of the Soviet Union's automobile factory have any problems we urge that you lay them before him.

New Role for Marines

• • • An abstract expression can seldom be translated to another language without loss. Japanese radio commentators say, for example, that the phrase, "Tell it to the Marines," proves we regard our Marines as incredibly credulous. As we have no subscribers in Japan at the moment, we can say in safety that this interpretation of the phrase can only lead to trouble.

Transferring an expression from one language to another is as futile as explaining a joke. Our "So what?" can hardly be defined in our own language, let alone attempting to transplant the Russian "nichevo."

Thinking in Pictures

• • • But expressions based on concrete objects thrive in any lingual soil, provided only that the object be known in the country to which it has been transplanted. A. W. Miller, for instance, cites "phonograph finish," a phrase he finds in a Warner & Swasey instruction book. A phonograph finish is a lightly grooved surface, made by using a sharp-pointed facing tool and a coarse feed. It is used on pipe flanges, for example, to keep the gaskets from slipping.

It conveys a perfect impression to anyone who has

ever seen a phonograph record, and bolsters Mr. Miller's boast that "nowhere is there a richer production of transferred meanings to convey graphic expression than in the metal-working industry."

Holmes To Horse

• • • When the "Instantaneous Clue Converter Co., Cincinnati," appeared on last week's list of new subscribers we put on our fore and aft cap and deduced that a customer intended for the *Detective* magazine had been ushered into our pew in error. But it turned out to be an elementary error. Merely a slip of a typist's finger, making "Clue" out of "Glue."

Flattery Without Finesse

• • • We are as pleased as the next one with those who are able to make us feel more important than is our due. But like precipice-jumping, the act of ego-expanding must be done perfectly or better not be attempted, for when it falls short it produces the exact opposite of the result intended.

We mentioned recently, for example, that another publisher invited us to read his magazine because it is read by Mr. Alfred P. Sloan, Mr. Thomas Watson, Mr. A. P. Giannini, Mr. Henry Ford, and others to whom the price ceiling on Scotch means little. The invitation failed to make us glow because the gap was too great for our spark to jump.

As an illustration of the ego-upbuilder with both throttle and cutout wide open, we quote this from a form letter sent out by a midwestern manufacturer:

Having mailed a copy of this booklet to President Franklin Delano Roosevelt, also to the Secretary of War, it occurred to us that you, too, would like one.

Our plea is not for less of this sort of thing. It serves a useful purpose. But let it be done with adroitness.

Important Job for Used Copies

. . . You had a recent item asking people to turn over copies of technical magazines to service men's hospitals and rehabilitation centers.

Who, exactly, takes them? We have a number of such magazines and feel it would be far better to turn them over to the men than to destroy them.

—Katherine Clark,
Powder Metallurgy Laboratory,
Stevens Institute of Tech., Hoboken, N. J.

Some of the advertising associations collect technical magazines from advertising agencies and deliver them to the hospitals and rehabilitation centers. Other than that the transfer is accomplished only by the technical journal subscriber who is near an Army or Navy hospital finding out whether discarded copies are wanted, and sending them himself. They usually are wanted, for every man in uniform is conscious of his personal postwar employment problem, and sees in the technical journal or business paper a means of filling the gaps in his knowledge.

Puzzles

• • • We have not yet heard from the master minds regarding last week's problem, which had to do with the highest figure that can be expressed with five 3s. Andre Lion, who suggested it, offers 3! 3! 3! 3! 3!.

W. H. (Hyatt Bearings) Chapman expresses every number up to and including 37 with five 3s, and adds, "I think this exhausts the list of consecutive numbers expressible by this method." W. B. (Thomson Wire) Durkee and Martin Wm. (Westinghouse) Offinger prove he is wrong by carrying through 40. Both are stalled by 41.

Mr. Offinger sends this in:

Using the digit 1 four times, form consecutive numbers up to and including 34.

He says 35 is the stumbling block, but if that is skipped the series can be carried much higher.

"A name worth remembering"

Fairbanks-Morse

To search constantly for ways to improve is a basic Fairbanks-Morse policy. Development work goes on continually in our research laboratories—in good years and bad, in time of peace and in time of war. During the months and years ahead this research will yield a rich harvest to users of scales, Diesel engines, generators, motors, and pumps.

R. H. Morse
General Sales Manager



Sturdily built without springs or delicate parts, Fairbanks-Morse Scales are more than highly accurate weighing instruments. In their countless types, styles, and modifications they weigh while materials are moving, furnish printed weight records, count small parts and products, weigh and disburse preset amounts automatically, and can keep ingredient proportions secret.

Fairbanks, Morse & Co.
Chicago 5, Illinois

Scales

Diesel Locomotives • Diesel Engines • Generators • Motors
Pumps • Scales • Magnetos
Stokers • Railroad Motor Cars and Standpipes • Farm Equipment

BUY MORE WAR BONDS

Dear Editor:

MILLIMETER MIXUP

Sir:

Please inform H. De Wilde (Nov. 23 "Dear Editor") that the metric system is not as hot as he thinks it is. After having used it for 150 years the French still buy the vegetables and other things purchased by the common people by the "livre" or pound, and not by the kilo. They also tried a decimal week of ten days, but that fell on its face in a hurry. The whole system is based on a misapprehension—that a meter is 1/10,000th or so of a parallel of longitude—and on an outmoded glorification of the Goddess of Reason and the Natural Man.

We do not use the metric system in this country, in spite of the meter being the official standard of length, because Americans realize that metric dimensions can only be divided by 2 and 5. Since nobody except glove-makers needs to divide by 5, this leaves only one handy factor. The 12-in. foot can be divided by 2 and 4, and also by 3 and 6—the same figures used in dividing the circle by radii. The hour of 60 min. and the minute of 60 sec. are almost ideal in this respect, dividing by 2, 3, 4, 6 and 12, and by 5 and 10 for those who count on their fingers.

A. W. MILLER

55 Liberty Street, New York, N. Y.

PRECISION CASTINGS

Sir:

In your Nov. 9 edition the article by Mr. Albin on precision casting mentions suppliers of precision casting wax.

Recently we have developed several waxes which are being used commercially at the present time. We have one wax which has proved particularly effective for pressure casting where close tolerances are desired and for wax patterns whose tolerances are not so important and where the patterns are made at lower pressures.

W. A. BRIDGEMAN

Manager Field Research

S. C. Johnson & Son, Inc.,
Racine, Wis.

Sir:

One hesitates to disagree with such an authority as Mr. B. L. Levinson who, in the Oct. 26 issue in his article "Industrial Precision Castings," questions the statement that investment castings can be produced with an accuracy of what amounts to a little more than 0.1 per cent. However, for a number of years I have been able to produce dental castings with an expansion controlled to .1 per cent between 1.0 per cent and 1.6 per cent by means of accurately timed hygroscopic expansion of the mold before it finally becomes hard. This work was done with a special hygroscopic investment material and tested with a Zeiss super optimeter.

KARL F. SCHEU

Terry Company,
197 Sidney St., Cambridge 39, Mass.

MALLEABLE IRON

Sir:

What books can you recommend dealing with the manufacture of malleable iron castings, particularly pipe fittings and such?

A. MAC B. STEWART

R. Maes Export & Import Corp.,
165 Broadway,
New York 6

● We suggest "Metal Castings," by John L. Campbell, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, \$3; "Foundry Work," by Stimpson, Gray and Grennan, published by American Technical Society, Drexel Ave. and 58th St., Chicago; "Cast Metals Handbook," 1944 edition, published by American Foundrymen's Association, 222 West Adams St., Chicago.—Ed.

MACHINERY SURPLUS

Sir:

We are particularly interested in the article by T. E. Lloyd in your Nov. 16 issue, "Surpluses to Threaten Screw Machine Industry," and find your statistics accurate.

We should like to obtain reprints for our membership. Please bill us for charges.

KATHRYN MacCRAE

National Screw Machine
Products Association,
13210 Shaker Square,
Cleveland 20, Ohio

● For the duration of the war, at least, we are unable to furnish reprints in bulk due to the rationing of paper. However, you have our permission to have the reprints made by your own photo-lithographer.—Ed.

DOLOMITE REFRACTORIES

Sir:

We would like copies of the article on dolomite refractories by J. H. Chesters in your Aug. 5 and 12 issues.

S. WALTER STAUFFER,

President and Gen. Manager

National Lime Association,
927 Fifteenth Street, N. W.,
Washington, D. C.

● Our supply of copies of these issues is exhausted. However, these and other articles of the series by Mr. Chesters are now available in book form. The book may be obtained from J. H. Chesters, United Steel Companies, Ltd., Stocksbridge, Nr. Sheffield, England.—Ed.

NON-FERROUS ALLOYS

Sir:

We were impressed with the utility of "Non-Ferrous Alloy Specifications" in your Sept. 14 issue, pages 66 to 98. Please advise if reprints are available and price. We will need six copies.

E. W. WILDES,

Asst Metallurgical Engineer

Adel Precision Products Corp.,
10777 Van Owen Street,
Burbank, Calif.

● It has been reprinted in booklet form. The price is 25c for one, 16c for five or more.—Ed.

MACHINING RATES

Sir:

Can you inform us where we can secure standard rates for drilling, punching and sawing steel? For instance, we have one drill press capable of drilling one hundred 0.5-in. holes per hour in 0.5-in. mild steel bars. A punch press will punch over 300 holes per hour in the same mild steel bars.

We read many times of "standards" for this kind of work, but have never been able to secure any records of this kind.

L. C. VAN PATTEN,

Manager

Cheney Weeder Co.,
Cheney, Wash.

● See "Time & Motion Study and Formulas for Wage Incentives" by Lowry, Maynard and Stegemerten, price \$5, published by McGraw-Hill Book Co., 330 West 42nd St., New York 18. We believe corresponding data will also be found in "Time Study Engineering" also published by McGraw-Hill. Books may be ordered on ten-day approval.—Ed.

COLORING BRONZE

Sir:

What is the formula used in oxidizing bronze to develop a brown coloration? I have seen this done by immersing the sandblasted bronze article in an alkaline solution followed by another solution in which it remained until the desired tone of brown appeared.

I would appreciate it if you could furnish me with the above formula, including the making of the alkaline and oxidizing solutions.

A. J. LYTLE

111 1/2 W. Second Street,
Waterloo, Iowa

● Try an alkaline cleaner followed by a sulphide solution, such as liquid sulphur or liver of sulphur. The concentration of the sulphide solution depends upon the kind of bronze and might vary from 1/2 oz. to 4 oz. per gal.—Ed.

SCRAP PRICES

Sir:

We are looking over your scrap quotations but are unable to determine whether the 50c per gross ton commission is included in the prices you quote or whether these quotations are made without regard to commission. May we have information on this?

W. C. ECKERT,

Purchasing Agent

Keystone Steel & Wire Co.,
Peoria 7, Ill.

● We quote prices delivered to the mill. The broker's profit (or loss) varies considerably, depending upon his judgment and the market trend.—Ed.

PLASTIC COATINGS

Sir:

I read with interest your Nov. 2 article, "Plastic Coatings for Metals," by Charles Delmar Townsend, and would appreciate a copy.

ROBERT TONON,

President

Peter Gray Corp.,
Third and Binney Sts.,
Cambridge 42, Mass.

The Nested Spring

THAT'S A BIRD OF AN IDEA!



● How to pack more spring into less space has always been a problem in product design. And today, when so many plans call for a reduction in product size or packing more power into a unit of the same size, the problem is even more serious. The nested spring is often the answer. It eliminates, in many cases, changing the size or design of the assembly in order to provide working space for a spring of increased capacity.

Designing nested springs requires more than just fitting one spring inside another. Whether to use round or square wire or a combination of both is involved. Extremely careful attention must be given to proper stresses and clearances. These, plus many other factors, emphasize the need for skilled spring engineering, and that's why so many product planners bring their problems to MUEHLHAUSEN SPRING CORPORATION, (Division of Standard Steel Spring Company), 817 Michigan Ave., Logansport, Ind.



Send for free booklet
on the importance
of spring design.

To improve product performance, use **MUEHLHAUSEN**
Designed SPRINGS

This Industrial Week . . .

- **Shell Programs to Be Greatly Expanded**
- **War Needs Bring Civilian Moratorium**
- **Scrap Prices Increase in Full Swing**

SMASHED hopes of an early German defeat and the tough hard fighting in the European theater have been followed on the home front by an increased tempo in war steel production and a moratorium on talk and output of civilian steel.

War programs are being rearranged, stepped up and enlarged so as to cover any eventuality in the European war field even to the extent of the war lasting until next summer. Although it may now take that long for Germany to be battered down, current war steel requirements reflect the absence of a chance that this may not become a fact.

Steel activity this week was rapidly moving upward and there were indications that before the new secondary peak in war output is reached, the level of output for some war items may approximate previous highs. This is especially true with respect to the ammunition programs.

Steps to sidetrack civilian production taken thus far have won general approval from the steel industry, but inquiries for military steel strengthen the belief that civilians will have to tighten their steel requirement belts still further. The apparent inability of far western mills to absorb as great a steel plate load as had been hoped, further complicates the problem of substantially increasing the steel industry's shell steel output.

Although the heavy shell steel needs which are slightly more than 300,000 tons in this month will probably be expanded moderately in the first quarter of 1945, the greatest increase in the ammunition program will come in the small and medium sized field. It is believed that by next September steel requirements for medium and small sized shells will have increased more than 40 per cent over recent tonages. Whether or not this goal will be reached depends upon the length of the war abroad, but that the armed forces will leave no stone unturned to strive for what is currently regarded as a necessity, is now a foregone conclusion.

The impact of the newly expanded shell steel programs which in the overall will be increased as much as 20 per cent with the greatest increment in the smaller categories will be tremendous on the output of other steel items. Some steel companies are now facing production and delivery problems strongly reminiscent of several months ago, before cutbacks gathered momentum.

THE first civilian casualty has been the cancellation of plans to abolish the maximum warehouse large sized bar load directive, which was to have become effective in January. Because of heavy military structural steel requirements, a cutback in rail output which had been slated for new highs may be the next logical means of aiding shell steel production. Further relief could be afforded by government-sponsored shipment of ingots to mills which have more finishing capacity than ingot capacity.

Intimately tied up in the delicate balancing and scheduling of shell steel are such products as semi-finished steel, plates, rails, bars and seamless tubing. The increase in shell steel needs must come out of some or a combination of all these products. Despite the apparent and current easier trend in plate output, this may prove to be a short-lived mirage. An additional 60,000 tons of steel, mostly plates, will be required for December, January and February delivery for an increase in the 1945 Navy pontoon program. There still remains the probability that when the Maritime Commission terminates its balancing and utilization of inventories for ship construction, it may re-enter the steel market at a time when shell steel needs are giving birth to new production difficulties. Furthermore, Navy programs for auxiliary ships might take an upward swing.

Steel orders recently have been on the rebound and deliveries on practically all products have again become quite extended. Some companies are promising wide plates for March delivery compared with February a few weeks ago. Deliveries on other types of plates in the 84 in. category have become extended to April compared to February recently. The heavy demand for structural steels coupled with the effect of the current product mix has extended deliveries for those items to as far as April, whereas a month ago February delivery could be obtained from some companies. Carbon steel bars are now being promised for March and April compared with February a short time ago and alloy bars have gone from December promises to February and March. Furthermore, there is no assurance that by the first of the year deliveries will not be again extended. Flat rolled products such as flat rolled sheets are bound to feel the effects of the newly accelerated war programs from such needs as cartridge clips, shell cases and steel packaging.

AN upward movement in scrap prices at all locations except the West Coast was in full swing this week. THE IRON AGE steel scrap composite price advanced \$1.59 a gross ton this week to \$18.87 a gross ton.

National steel ingot operations remained the same this week at 95.5 per cent of rated capacity, the previous figure having been revised upward. Pittsburgh operations are down one point to 92 per cent while Chicago has dropped half a point to 101 per cent. Philadelphia is down half a point to 96 per cent. Cleveland output has decreased one point to 98.5 and Wheeling production is off half a point to 91.5 per cent. Detroit at 100 per cent has gained two and a half points over last week's operating rate. Other districts showing output gains are Cincinnati, up six points; Western, up two to 92.5; St. Louis, up two to 94.5 and the Eastern District, up three and a half to 98 per cent. Youngstown at 93; Buffalo at 90, and Birmingham at 99 continued unchanged.

• **STEEL PRICE ADJUSTMENTS**—The steel industry through its OPA Advisory Committee is now in the process of preparing a petition for price relief. A previous petition was withdrawn last March when the OPA was on the point of allowing about \$4 a ton relief on such items as plates, rails, hot rolled sheets and bars. Some sources say that the new petition will in reality be an extension of the old one, since it is claimed the OPA has never closed the case. It is pointed out that OPA's willingness earlier this year to allow price relief or product adjustment was predicated on accumulated cost increases not including any wage adjustments which might subsequently be granted.

• **STEEL REPAIR COSTS**—Expenditures for plant repairs and maintenance by the steel industry during 1943 established a record of \$528,000,000, an increase of 13 per cent over the \$465,000,000 spent during 1942, according to the American Iron & Steel Institute. The 1943 cost of maintenance was more than three times the amount expended for similar upkeep during 1938, when \$171,000,000 was spent. The sharp rise in expenditures for repairs and maintenance last year reflects the long continued high rate of activity by the industry, and to some extent higher costs of labor and equipment. Year by year since 1938 the amount spent for upkeep has risen. In 1939 the amount spent was \$247,000,000; in 1940 it was \$305,000,000; in 1941 it was \$420,000,000. For each ton of hot rolled iron and steel produced last year repairs and maintenance charges equalled \$8.35, contrasted with \$7.45 per ton in 1942, and \$6.30 per ton in 1940.

• **FABRICATED STEEL BOOKINGS**—October bookings of fabricated structural steel for bridge and building construction reported to the American Institute of Steel Construction by companies representing 75.1 per cent of the total average of the industry during the years 1923-1925, totaled 77,608 tons. This figure compares with 49,999 tons for September, and 59,282 tons for October of last year. The reported October shipments for bridge and building construction totaled 48,459 tons as compared with 80,093 tons reported for the same month last year. The reported tonnage available for future fabrication on Oct. 31 was 174,426 tons.

• **STEEL MEDICAL MEN ORGANIZE**—To help solve the problems of reorienting former steelworkers returning from military service, doctors heading up the medical departments of leading steel companies have been organized as a committee of American Iron & Steel Institute. One of the first tasks of the Committee on Industrial Health is a study of the programs set up by various companies in the industry for rehabilitating war veteran employees needing special consideration in re-employment.

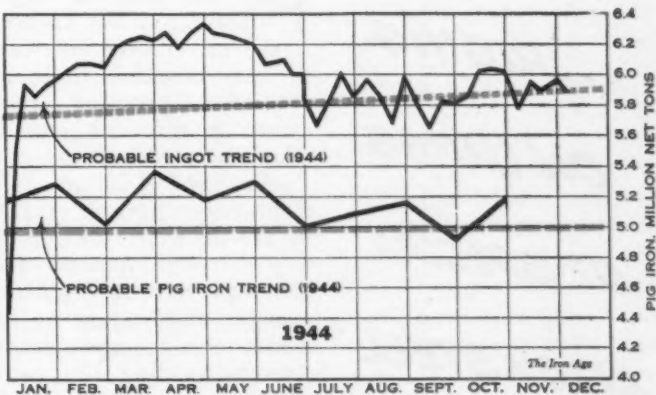
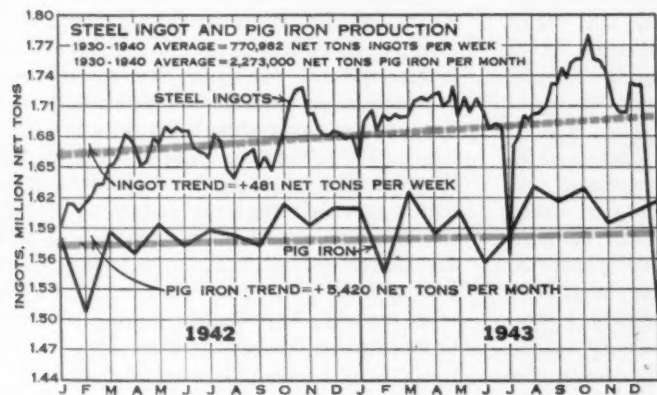
• **PEACE VALUES GOVERN DPC SALES**—Government owned war plants are being re-evaluated upon the basis of their worth in an ordinary peacetime market preparatory to the time when they are declared surplus and offered for sale, according to B. A. Mattingly, Chicago regional manager of the surplus war property division of RFC. The possibility of future operation of many plants, such as the Geneva Steel Works in Utah, will depend heavily on these evaluations. So far less than a dozen plants in the nation have been declared surplus. Cash offers are preferred to term agreements, but RFC will consider even short-time leases, according to Mattingly.

• **CANADIAN FARM EQUIPMENT**—Claude W. Lockard, president, International Harvester Co. of Canada, Ltd., Hamilton, says his company has received an order from the United Nations Relief and Rehabilitation Administration for 15,000 pieces of farm equipment. He said that, while the company's French factories have not been damaged, preparation for full production may take many months, and in the meantime supplies will be sent from this continent.

• **SMALL BUSINESS LOANS**—Ten million dollars for loans to small and medium sized businesses in the reconversion and re-employment periods has been made available by the Cleveland Clearing House Association, according to an announcement this week by George Gund, Association president.

• **CIVILIAN AIRPLANE OUTLOOK**—Lockheed Aircraft Corp. holds orders for 18 giant Lockheed Constellations from Eastern Airlines and National Airlines, Lockheed officials who attended the international civil aviation conference at Chicago said. Eastern ordered 14 of the 45-ton planes and National four. The Constellation can carry 48 chair passengers or 34 sleepers.

• **TANK ENGINE ORDER**—Ford Motor Co. has been awarded a new ordnance contract for \$28,000,000 worth of tank engines. The order calls for an increase in production of standard engines which the company has been making for more than two years, and includes the company's first large order for a new tank engine. The standard Ford engine, with 500 hp. rating, has been produced since it was developed by Army Ordnance and company engineers in 1941 for installation in all military medium tanks. Recently the 15,000 tank engine was produced by Ford on the assembly line at the Lincoln plant.



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
November 28...	93.0	101.5	93.0	96.5	99.5	90.0	92.0	99.0	97.5	90.5	98.0	92.5	94.5	95.5*
December 5...	92.0	101.0	93.0	96.0	98.5	90.0	91.5	99.0	100.0	92.5	106.0	94.5	98.0	95.5

* Revised



Photo courtesy Lockheed Aircraft Corp.

STROKE OF *Lightning* IN THE SKY

**...RIDING
ON LUNGS
OF SPECIAL
ALLOY STEEL**

FOR the superior high-altitude performance of the Lightning and other first-line American warplanes, give primary credit to their engine "lungs"—the GE Turbo-Supercharger—a milestone in research and design, and a triumph in metallurgy and production.

Allegheny Ludlum collaborated on turbo-supercharger research for years before the war. Our chief contribution was the development of a commercial technique to centrifugally cast the supercharger diaphragm—an intricate shape which was formerly laboriously fabricated by welding. This casting, made of a highly complex alloy steel which maintains its strength at red-hot temperatures,

was much stronger, more durable and more efficient than the fabricated article. And, even more important, the way had been opened for quantity production.

Already, in gas turbine work and other directions, these developments are bearing additional fruit. Just remember that the function of Allegheny Metal and our other special steels is either to do the thing that once seemed impossible, or to do better what is already being done. Let us help you apply these materials to your needs. • Allegheny Ludlum Steel Corporation, Brackenridge, Pa.

Allegheny Metal is also handled and stocked by all
Joseph T. Ryerson & Son, Inc. warehouses

W&D 9494-B



ALLEGHENY METAL

The Time-Tested Stainless Steel



REMEMBER THE NAME TODAY FOR THE NEEDS OF TOMORROW

Steel Industry to Petition for Price Relief

New York

• • • The War Labor Board award to steel labor, estimated at from 5c. to 9c. an hour, net increase in steel payroll costs has brought the question of price relief into the spotlight. The steel industry through its OPA Advisory Committee is now preparing to petition for price relief and the formal move is a foregone conclusion.

From a practical standpoint this move is not new but an extension of one set in motion more than a year ago. Steel costs last year were studied pro and con and finally early this year the OPA was willing on the basis of its findings to allow increases on plates, hot rolled sheets, bars and

See Washington Comment, page 92, for other steel price news.

rails. The amount generally mentioned for an increase was \$4.00 a ton.

Because of the pending wage cases and because of the steel industry's desire to table the matter at that time in view of the government's anti-inflation stand, the price increase demand was withdrawn—but the OPA, it is said, never closed the case. The increases which the OPA was said to be amendable to then were on the basis of higher steel making costs not including any wage increase which might be subsequently granted.

Since last year and early this year when costs figures were used by OPA to determine the need for price adjustments, many steel companies have shown higher net operating costs. This has been due largely to the completion of some orders involving steel on which the profit was enough to partially offset items on which the profit was low or non-existent. The product mix recently has leaned towards higher tonnages of plates, rails, hot rolled sheets and other products on which industry members claim there is too little return. It is claimed by some steel people that selling price realizations have declined substantially in the past several months and that costs have been going up since the war started. This condition, it is said, will become more aggravated by the recent WLB award.

Just as the WLB labeled its recent wage action, an adjustment

By TOM CAMPBELL

• • •

which did not affect the Little Steel formula, so may the OPA, when and if it grants steel price relief, insist that such a move will be an adjustment and not a price increase. Steel men feel that any action of OPA towards relief will take the form of advances on specific products. It is believed that the same ones which received favorable attention early this year will get the same break when present data now being prepared is acted upon by OPA.

The War Labor Board is of the opinion that no increase in the price of steel is needed and through its chairman says the money the steel industry needs to cover the WLB award will come from "profits and more effi-

cient management." A recent OPA inter-office memorandum based on a study of the U. S. Steel Corp. alone claimed no increase in steel prices was warranted even though the full 17c. demand was granted. This report, however, which never was classed as OPA's official voice was said to be weak in that a study of the U. S. Steel Corp. included data covering ore mining, transportation, cement making, steel making and all other endeavors including big steel's domain.

From a logical standpoint, the fact that OPA last March was willing to grant price adjustments on some products on the basis of accumulated steel cost increases not including any subsequent wage increases or adjustments seem to point to definite price relief for the industry—but one can never tell.

• • •

WLB Head Says Steel Price Rise Not Needed

Cleveland

• • • A rise in steel prices should not follow the wage award last week by the National War Labor Board in the Little Steel case, according to William H. Davis, NWLB chairman, who asserted here last week that he would be "very much surprised if any price increase follows."

Appearing at a labor forum spon-

sored by the Ohio Chamber of Commerce convention, Mr. Davis said this money will come from "profits and more efficient production" and that the effect on prices of all wage increases granted under the ceiling of the Little Steel formula could be put in a hollow tooth."

Participating in a press conference with him were L. Metcalfe Walling, wage-hour administrator, and Carroll R. Daugherty, national wage stabilization director, who backed up Mr. Davis' statement.

A day later, Tom M. Girdler, chairman of the board of Republic Steel Corp., contradicted Mr. Davis' remark regarding a steel price increase, asserting this remark was "made without a real understanding of the facts, and it is evident that there must be a steel price increase regardless of the latest wage award."

Mr. Girdler pointed out that although steel prices have been frozen at the 1939 level, wage increases totaling 15½c. per hr., have already been granted and the suggested WLB award would mean an additional 10c. hourly."

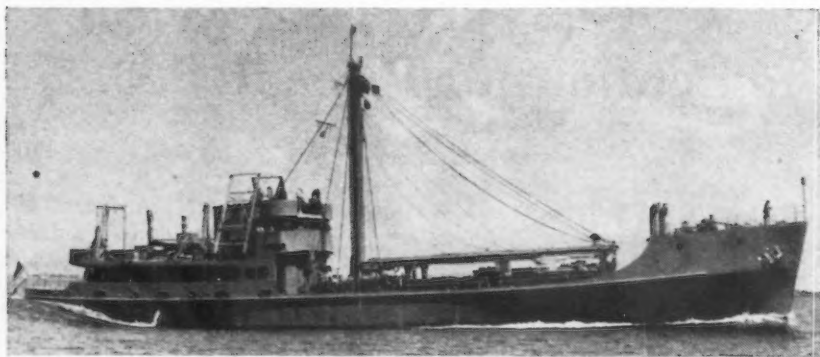
"Republic, now losing money on many of its basic steel products, cannot pay additional wages under 1939 steel prices without endangering its financial position," he said.

Steel Price Attitudes

OPA—No comment expected before petition of industry is received and studied.

WLB — William H. Davis, WLB chairman said in Cleveland last week that a steel price increase should not follow the wage award and predicted the money needed to cover the increased costs would come from "profits and efficient management."

STEEL MAN—Tom Girdler, Republic Steel board chairman branded Mr. Davis' statement as a remark "made without a real understanding of the facts and it is evident that there must be a steel price increase regardless of the latest wage award."



A. J. Higgins Planning National Transport Systems for Small Nations

.. By C. T. POST ..

New Orleans

• • • Andrew Jackson Higgins, who modified a swamp boat bearing his name to help beach the Allied invasion armies, has well developed plans to become a world wide transportation doctor in the immediate postwar years.

Higgins has hit the front pages with sponsorship of a cargo carrying flying wing and actual construction of a helicopter, but his basic hopes for the future are buoyed on mass production of shallow draft cargo boats, most of them modifications of designs which have found military usage.

Before the war, Higgins makes no secret of the fact that he was a small boat builder, catering to the special requirements of the bayous, swamps, and rivers within a modest radius of New Orleans, but the scope of post-war plans, if they come to fruition, would make the title "transportation merchant" more descriptive. The master sales plan lays its money on an analysis of the history and geography of transportation for whole countries rather than upon cultivating individual sales outlets.

The broad outline is described in a booklet entitled "The Higgins System of Transportation," prepared by George W. Rappleyea, Ph.D., one-time Tennessee iron producer, now vice-president of Higgins Industries, Inc. Possibly an illustration of the effectiveness of the "Higgins System" argument, a mammoth pin studded map now adorns one of the big Higgins offices testifying to a diagnosis of Mexico's entire transportation network for the Mexican government.

"There are two principal factors that will make or break any system of transportation," the booklet postulates. "They are cost and speed." This observation is preceded by an analysis of the growth of transportation in the United States, illustrating how the growth of each mode has swollen and ebbed, until today a complex and heavily capitalized web of railroads, truck lines, and air lanes ties together the nation's producing and consuming centers. Steamboat lines, both river and coastwise, are sharply written off as a major factor, but it is observed, large scale dam building activities on the upper reaches of the principal American rivers has resulted in the doubling of barge transportation every year for the past two decades. Thus the tow-boat field emerges as probably the principal domestic hunting ground for Higgins, with a strong bid for pleasure craft sales.

But the big undeveloped market, the booklet expounds, lies in Africa and South America, where lack of transportation facilities has retarded commerce and industry. Frankly admitting the virtues of highways and railroads, the Higgins plan shelves them temporarily because of the difficulty of financing without putting a small nation into hock. This leaves the natural, undeveloped waterways. Here, rapids, waterfalls or obstructions heretofore have retarded navigation, making necessary unloading and reloading at portages making transportation costs too high for wide development. Enter the Higgins boat, of which 80,000 are mentioned as having been built for war use. Precisely,

the key to the boat's future is its so-called Eureka hull, which is responsible for its shallow draft, and which allows it to ply streams choked with vegetation, or even to hurl itself over narrow strips of dry land. Designed for fur trappers and oil drillers in the cypress swamps and bayous of southern Louisiana, the basic principle and mechanical details of the craft were patented by Higgins in 1939. This hull was the core of the Higgins business which allowed it to expand from 300 employees in 1939 to 16,000 in 1943.

In the remote reaches of tropical streams it is contemplated that a 36-ft. Higgins LCVP (landing craft, vehicle-personnel) could operate with a truck. By constructing short portage roads, the truck could roll around rapids and obstructions while the boat, in many cases, could make its own way. Moreover, the truck could be used for local hauling in villages along the way. Corresponding to the wooden LCVP unit is the LCM, a 56-60 ft. welded steel, diesel powered boat, the same general design, with ramp loading of vehicle, to be used in more navigable reaches. In tidewater regions, Eureka landing boats, with towing knees, could be used to push sectional built 60 ft. barges assembled on the banks of the rivers.

Complementing these smaller craft, for coastwise service or more favorable waterways will be an adaptation of a 180 ft. FP (freight-passenger) class cargo ship, now built for the Army. The market for these boats, mass produced, is predicated on reasoning that for every port which will accommodate a vessel of 30 ft. draft, there are 100 which will accommodate boats of 8 or 10 ft. draft. Of 1200 ton displacement, these boats are powered by two 500 hp. diesel units. These ocean-going vessels are capable of terminal to terminal transportation in traffic between commercial centers and remote ports, sometimes hundreds of miles upstream. Each time longshoremen's wages are raised another notch, the market increases, making it more desirable than ever to eliminate rehandling of cargo for transfer to large ocean going vessels.

Taking a page from the book of truck manufacturers, who operated on a national scale, Higgins goes into the international market with "a plan whereby a national government could obtain all the transportation facilities it needs to develop its resources and secure economic freedom for its citizens, to be financed on a pay-as-you-

go plan, with equipment purchased out of its earnings."

Before inaugurating such a system, Higgins engineers would make a complete survey of the nation and its waterways, and either make an original economic survey, or check and bring up to date previous economic surveys of the nation. The mapping, of course, gives an opportunity to use the so-called oblique photographic survey method for which Higgins holds the patent. Higgins also claims the largest private chart library 'n the world, showing coastlines and harbors of practically every country in the world, useful in the surveys. Higgins would compile tariffs and freight rates, tailor-made to local conditions, and if desired, supervise establishment of a government controlled transportation corporation and training of employees.

The creeping realization that Higgins Industries, Inc., is responsible for everything from a patented toilet flusher to an educational system is borne out by the examination of war contracts currently underway.

Besides personnel and equipment landing boats, PT boats (which, incidentally, form the basic hull design for a postwar cabin cruiser), steel and wood tugboats and barges, amphibious equipment and cargo ships, Higgins Industries, Inc., now is turning out, among other things, torpedo tubes, power gun turrets, sound communicating devices, radio telephones, frequency crystals, smoke generators, water purifiers and salt water converters, engine clutch and reverse gear mechanisms, hypoid and helical gears, plastic bonded plywood products, lifeboat releasing gears, turbine type pumps, remote engine controls, mechanical steering devices, twin machine gun turrets, cannon stabilizer and siding controls, and marine engines.

In this last category a 200 hp. six cylinder gasoline engine, weighing 1610 lb. with accessories, is slated for postwar use in powering the smaller landing boats and tugs. A crossdrive has been developed so that a pair of engines connected to one propellor shaft can be run separately or together, depending on the power and speed needed.

The Higgins verve is practically unsinkable, for the firm has been hit by some of the biggest contract cancellations of the war. Largest of these was the contract to build C-46 cargo planes, for production of which a 30 million dollar DPC aircraft plant was built. Early in the war, a Liberty

ship contract was wiped out before production got underway, and in the shadow of considerable controversy. Only this fall a big marine engine contract went out the window.

But news making products still spout out. One is a dropable lifeboat, which fastens to the bottom of B-17 or B-25 bombers by the bomb shackles. Constructed of molded plywood cured in autoclaves (like the PTs), the "Flying Dutchman" lifeboat weighs 3000 lb., holds 12 people, and is powered by two aircooled 5 hp. motors.

Still under wraps is an amphibious jeep, known around the plant as the "turtle," constructed of the new Reynolds aluminum alloy, R-301, which has passed ballistic tests with flying colors. The "turtle" mounts sufficient armament to protect itself against a tank. Its most noticeable feature, however, is that instead of operating on tracks, which are reputed to be the Achilles heel of most of the amphibious vehicles now used, it has four cleated drum-like wheels, all of which are powered by a central patented drive. The vehicle, as it now stands, is the culmination of experiments dating from the days when marsh buggies constituted the chief amphibious category, and it yet must win military approval.

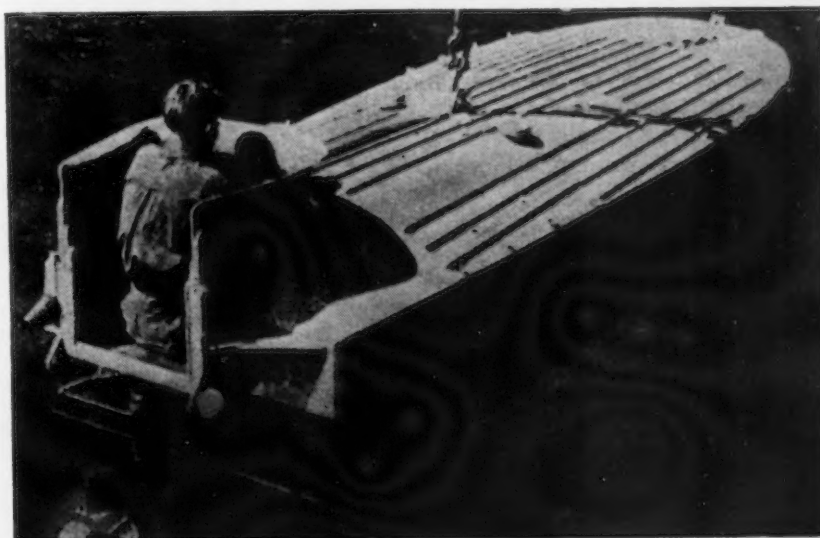
Contrary to popular conception, the Higgins boatbuilding operation does not represent merely manufacturing contracts being carried out in government owned plants, with a portent of shrivelling after the war. Neither do they represent a minor private investment, dwarfed by an RFC loan.

The Industrial Canal and City Park plants in New Orleans, where most of the boat building is carried on, the Higgins Engine Co. plant in New Orleans and the Santa Monica, Calif., radio plant represent an investment of nine million dollars, and are being amortized on five year certificates of war necessity. So far about \$2,500,000 of this has been amortized.

Higgins Industries, Inc., the parent organization, is more than 60 per cent owned by Andrew Jackson Higgins, himself. The single big DPC plant in the group is the Higgins Aircraft plant, representing an investment of 30 million dollars. This was built to carry out the aborted C-46 contract which is being wound up, and was the only manufacturing operation to be operated on a cost-plus fee basis. Although the loss of this contract is a sore point, it by no means represents a collapse of the main Higgins undertaking. A portion of the aircraft plant now is being rented by Higgins Plastic Corp. for the production of bonded plywood used in boat construction. Another section is being used for a Higgins contract for overhauling a larger number of jeeps, and there is some possibility that the entire plant may be taken over on a rental basis.

Other Higgins operations in the New Orleans area are the Bayou St. John plant, an outfitting and loading base; the City Park lumberyard; the lake front boat service station; the army operators' school; and the retail sales and service department, the acorn from which the mighty oak grew.

AMONG SECRET WEAPONS: Added to the long list of what Germany calls secret weapons is this motor speedboat, carrying a load of high explosives and guided by one man who leaves the craft as it approaches the target.



Dearth of Manpower Continues As Foremost Specter of Steel Plants

Pittsburgh

• • • Manpower is undoubtedly the greatest restrictive factor in steel production in this area at the present time. There are known to be several open hearths not in operation because of the lack of help, cold rolling of sheets has been seriously hampered, and shell and rocket production has not reached anticipated rates in most plants because of the lack of help.

One of the most successful manpower recruiting jobs done in this area since the beginning of the war was one executed during October and November by the National Tube Co., for help at its Christy Park shell plant, where 1600 workers were needed. The quota was actually oversubscribed.

The campaign consisted of display advertising in about 25 daily and weekly newspapers in Allegheny, Westmoreland, Fayette, and Washington counties, "spot" announcements on local radio station, posters in various communities, and a "flying promotion team" that visited these communities and set up community hiring depots.

The main efforts were directed toward seasonal workers, particularly farmers. Through the cooperation of the United States Employment Service, whose representative accompanied the recruiting team, prospective employees were solicited. Special appeals were made to farmers to work through the winter months. The contact with the farmers was direct, through Grange meetings. The idea of recruiting the farmers was sound in that they were hired with the specific understanding that they would work until spring plowing and planting could be started. The company felt that by this time, the urgency of criticalness of the shell program would be passed, and the help of the farmers would not be so vitally needed.

Through the cooperation of the Army and Navy, a campaign designed to impress each new employee with the seriousness of the war situation was begun at the Christy Park plant. Groups of 50 employees attended meetings in the plant, were addressed by combat personnel, and every employee was personally approached and told the story of the urgency for more war production.

A tougher recruiting job but one that is highly essential is the miner recruiting drive that Jones & Laugh-

lin Steel Corp. started on Nov. 27. At least 500 experienced miners are needed for the J. & L. mines at Richeyville, Vestaburg, Denbo, and Bobtown. Daily advertisements are being currently run in 11 newspapers in southwestern Pennsylvania, spot announce-

ments on radio stations, posters, and other aids are being used. Getting miners is an entirely different matter from getting more or less experienced shop help. Consequently, this program is not progressing as rapidly as other manpower drives. During the early days of the drive from 10 to 15 a day were being employed, but it is expected that this number will fall off rapidly and the quota may not be reached.

Lend-lease Iron and Steel To United Kingdom to Be Drastically Cut

Washington

• • • It is now expected that some raw and semi-fabricated materials, such as iron and steel, will no longer be provided by the United States to the United Kingdom under lend-lease after Jan. 1, 1945.

This disclosure is made in a report by a special committee of the government on lend-lease and reverse lend-lease discussions with the British following up the Quebec conference. The committee consists of Foreign Economic Administrator Leo T. Crowley, Secretary of the Treasury Henry Morgenthau and Secretary of State Edward R. Stettinius, Jr., who at the time the report was made was acting Secretary of State.

Cessation of lend-lease shipments to the United Kingdom, will remove the affected products from limitations applying to those articles received

under lend-lease which will be available to the United Kingdom in commercial exports only after the over-riding considerations of war supply and shipping are met. The committee said that it understands that, as in the past, the United States and the United Kingdom will both endeavor to insure, to the extent practicable, that neither United States nor United Kingdom exporters receive undue competitive advantage over the other as a result of the war situation.

While expecting an end to lend-lease shipments of steel and certain other products after the New Year, the report declared it appears that immediately following defeat of Germany, the British need for lend-lease assistance would be not much more than one-half of that furnished in 1944.

After the defeat of Germany, it was stated, the United Kingdom and the United States will both use all the fighting power that is required for the earliest possible defeat of Japan. The report said that it is likely, however, that both the United Kingdom and the United States will be able to reconvert part of their resources on an equitable basis to meet essential civilian needs in the period between the defeat of Germany and the defeat of Japan.

The committee said that the programs of lend-lease and reverse lend-lease aid until the unconditional surrender of both Japan and Germany should be continued in accordance with the fundamental principle laid down by the President.

There will be no change, the report said, in the principle as laid down in the British White Paper that no articles received under lend-lease from the United States shall be exported commercially.

WATERPROOF JEEP: Although completely submerged, this Air Force jeep's motor keeps purring because it and other vital parts have been treated with a waterproofing compound, and an exhaust pipe and air intake valve have been extended above the water line.



Certain Die Casting Price Relief Allowed

Washington

• • • Sellers who regularly make sales of new die castings below the maximum price may apply to OPA for permission to adjust prices up to the calculated maximum for re-orders. Effective Dec. 7, OPA has adopted Amendment No. 4 to Maximum Price Regulation No. 377 granting this permission.

The government pricing agency said that its action is intended primarily to eliminate any inequity which might result to sellers who have consistently sold new castings at a lower price than would have been permitted by the regulation. The regulation freezes the price of all die castings at the level at which they were sold or delivered during the period April 1, 1942 through April 30, 1943. In the case of castings which were not sold or delivered during the base period, the regulation provides that the seller shall figure his maximum price by using the pricing formula which he used on Feb. 1, 1943.

The regulation further provided that for a new die casting, one not sold or delivered during the base period, the price charged for the first sales becomes the maximum price for all subsequent sales of that die casting. As a result of this provision, a seller who makes his first sale of a new die casting at a price below the maximum allowed under the regulation was not able to increase his price above this first sales price even though the first price is less than he might have charged.

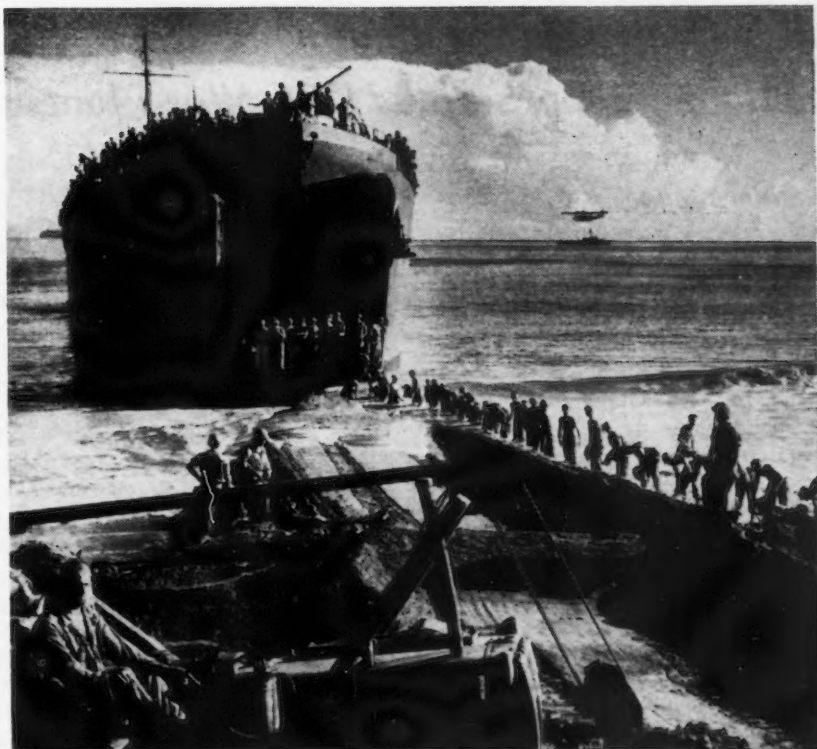
SUPPLY PROBLEMS:

Supply has been the bane of Allied operations from the early days of the war. Equipment now available minimizes the effort required to get in the equipment, but still does not eliminate the hazards of weather and distance.

Top: An LST unloads supplies and personnel on the shore at Leyte, in support of the newest Allied invasion. This is one of the first photos released showing the bow doors of the LST open.

Center: To rush oil to China a 2000-mile pipeline, to be the longest in the world, is being constructed from India. Sections of lightweight pipe are being flown in to China.

Bottom: Adding to General Eisenhower's normal supply problems in Europe are the worst floods in thirty years in eastern France.



RFC Organizes for Biggest Selling Job on Surplus DPC War Plants

By DONALD BROWNE

Washington

• • • RFC will establish here a centralized continuous inventory of all industrial products for which it has been named disposal agent except metal products, Sam Husbands, Director of the War Surplus Property Division of RFC said on Dec. 1. Mr. Husbands, who is also president of the Defense Plant Corp. said that the inventory would include a listing of such industrial products as machine tools and industrial equipment, chemicals and fixtures.

The RFC Surplus Property Division has jurisdiction over both the DPC and the Metals Reserve Corp. MRC is maintaining a centralized inventory of metal products in its New York office. Col. Joseph P. Woodlock, former sales manager for the Crucible Steel Co. has been appointed Assistant Surplus Property Director in charge of sales, Mr. Husbands told THE IRON AGE.

The creation of the centralized inventory for machine tools and industrial equipment chemicals and plant fixtures is an effort to speed disposal.

Colonel Woodlock is expected to organize the Sales Division promptly, to find buyers for several billion dollars worth of industrial property, which includes 500,000 government-owned tools.

Hans Klagsbrun, Deputy Director of the War Surplus Property Division and DPC Vice-President, appeared with Mr. Husbands before the Mead

(Senate) Committee last Friday to report progress in machine tool and plant disposal efforts.

While reporting that RFC has only about 4000 tools Mr. Klagsbrun disclosed that inquiries have exceeded surplus tool supply. He also pointed out that the government expects to maintain a strategic reserve of tools.

A recent auction of Navy Yard tools 25 to 40 years old netted \$287,000 or about 35 per cent of their original cost, Mr. Klagsbrun said by way of showing what present tool demand is. In normal times, these tools, obsolete equipment removed in modernization of Navy installations, would have been sold as scrap. Many of them have been stored out of doors for two years. He said that the Surplus Division is experimenting with the auction method of selling property and declared that RFC reviews all sales and maintains information on the original cost of articles sold, ceiling prices, the amount of recovery and the names of the purchasers.

When asked by Senator Mead, Democrat of New York, if lend-lease demands had priority over domestic civilian industry demands, Mr. Klagsbrun replied in the affirmative.

The DPC vice-president said that his agency is making every effort to inform the public of details of plants the government owns and to negotiate plant and tool sales in advance of the time when they have no further war use. Negotiations are in progress for the sale of approximately 250 war plants.

Negotiations with General Motors Corp. for a DPC-owned aircraft engine plant in Buffalo operated under a lease with an option to purchase was described. RFC finally agreed to sell below the price provided in the option.

After a price was agreed upon through negotiation, the corporation waived its option, the plant was extensively advertised in five or six war production centers. Only four or five inquiries resulted and none of them made a better offer than General Motors.

Mr. Klagsbrun said that the offer was then transmitted to the Department of Justice for approval, but the Attorney General has not reported his decision.

When asked what policy will be pursued with respect to plants which if a liberal credit policy were not followed might not be sold, Mr. Klagsbrun said that leases would be entered into rather than loaning purchase money to local communities or private individuals with insufficient capital, or entering into sales not requiring a down payment.

Mr. Husbands told THE IRON AGE that plants would not be sold to shoe string operators, but that terms of any plant sale would be discretionary with the RFC Board of Directors. Mr. Husbands said that the government does not want to sell plants to shoe-string operators and then have the plants back on its hands again because of the buyer's inability to make a go of it.

For companies not having the money or technical staffs to find out for themselves, Mr. Klagsbrun said that the 30-odd RFC corporations would furnish information regarding the plants.

To prevent unemployment and the disappearance of labor from plants which are up for sale, RFC has added detailed descriptions of plants, including photos and plots in making available all possible information to industry and the public at large. RFC already has listed 850 plants which it has financed. Another 150 plants are scrambled, and cannot be sold as individual operating units.

All but nine of the 1000 facilities have been surveyed by engineers so any information desired by buyers or interested parties is available.

RFC now has surplus property valued at \$780,000,000 and \$500,000,000 is in surplus aircraft. About \$100,000,000 worth has been sold for approximately \$80,000,000, the committee was informed.

SPANISH SPEED TRAIN: A new type of Diesel-powered Spanish train, pictured from the rear of the station in Guadalajara, is said to have a speed of 80 miles an hr. around mountain passes where a normal train could not exceed 31 miles an hr. without being derailed.



Somervell Announces Plan To Delay Reconversion for War Production

Washington

• • • Lieut. Gen. Brehon B. Somervell, Army Service Forces Materiel Director, told the Mead (Senate) Committee on Dec. 4 that the 311,479 man labor shortage in ASF programs could be solved by a program agreed to by the War and Navy Departments, WPB and WMC. If the new program does not result in solving war production difficulties after a 30-day trial, General Somervell told the Senators he would ask for National Service Legislation.

Steps which the war agencies have agreed to follow: Stopping of the spot authorization plan in 126 cities (Group I labor areas and certain critical No. II areas); reduction of employment ceilings in civilian industries to force workers into war industries; no further war order relaxation.

The ASF Materiel Director said that while soldiers have not suffered from lack of supplies because of production lags, and no battle strategy has been crippled because of short supplies he was apprehensive that this might happen if supply deficits are not made up.

The castings problem which the services have said is holding up various programs because of a 10,000 worker deficit will be solved this month, General Somervell said. This will be done with cooperative recruitment by AFL and CIO on a regional basis and by taking civilian work out of the foundries wherever necessary to meet military schedules.

Developments over the previous week end with respect to X-Day cuts, the new mortar and medium artillery ammunition facility program and the spot authorization plan had aroused interest in the War Department attitude on manpower. A WPB report referred to by General Somervell disclosed that 40 per cent of all production has lagged and manpower was said to be the cause of about 8 per cent of the schedule difficulty.

Mr. Krug told newsmen last Saturday that cuts in the Army supply program would not be as great as the 40 per cent previously announced by the War Department, because of the speeding up of the war in the Pacific, other WPB officials asserting that the X-Day cut would more nearly be 20 per cent.

A new \$500,000,000 program for

mortar ammunition, and the new small arms ammunition program will block reconversion if forbidding increases in tight labor areas does not, WPB officials say.

The mortar program, General Somervell said, will be largely a matter of retooling, but some new facilities will be built. The WPB Steel Division has not given any notice that military requirements will be increased in the first quarter as a result of the new programs.

Provided the military high command indorses the new Army program, it will be necessary to retain a number of limitation orders on materials which may be used for civilian manufacture and controls over manpower, perhaps until the time of Japan's defeat. Mr. Krug mentioned the construction of new facilities for peacetime manufacture as one phase

of reconversion that especially would be hard hit by the change of plan.

Mr. Krug remarked that the official policy toward reconversion had not changed at all, but that "the circumstances of war have changed."

On Dec. 1 the War and Navy Department, WPB and the WMC sent to field representatives a statement on the spot authorization plan which virtually put a stop for the next 90 days to approvals of new civilian production in 68 Group I labor areas and 47 other cities in Group II areas.

Only in localities where war production is on schedule, where schedules formerly reduced for lack of labor have been increased to the extent necessary and are being met, or where failure to meet schedules is due to causes for other than manpower shortage and where labor is not qualified and needed for war production (either in that locality or available for inter-regional recruitment) is currently available, can any request for spot authorization be approved.

Foy Leaves and Todd Succeeds Him on WPB

Washington

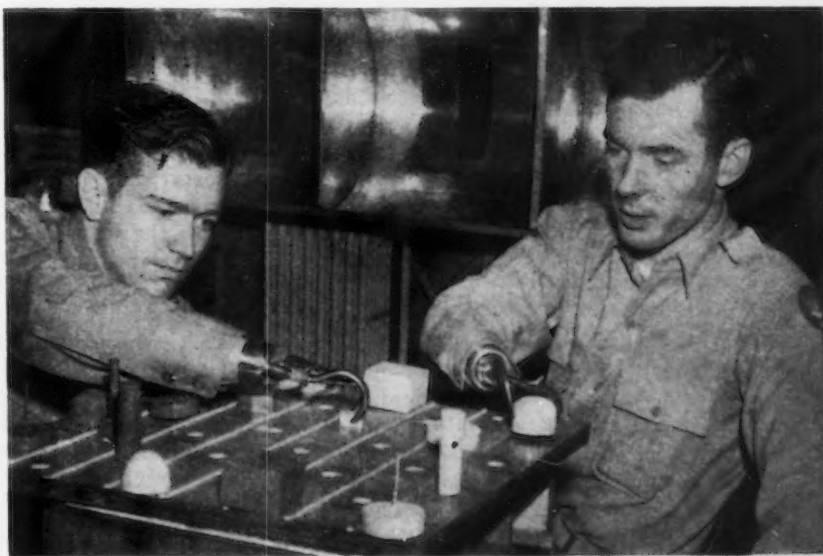
• • • William B. Todd has taken up his duties as WPB steel division director, succeeding Norman W. Foy, who resigned to resume his position as general manager of sales of the Republic Steel Corp., after three years of hard and hectic work for WPB.

Mr. Todd who has a background of

more than 40 years in the steel industry, has been deputy director of the Steel Division since May, 1944, and served for the previous 15 months as the division's representative in London. Mr. Todd was formerly with the Steel Export Association in England and also was at one time vice-president in charge of sales for the Jones & Laughlin Steel Corp.

Harry Francis who has been WPB assistant director in charge of production, was named as deputy director of the steel division.

MODERN SKILL: Two disabled lieutenants play a game of checkers using odd shaped men to exercise control of their artificial limbs at the Lawson General Hospital, Atlanta, Ga. This hospital is a center for amputation cases.



Industry Continues War Production; Makes Plans for Peace

Pittsburgh

••• While there are still many critical jobs to be completed before industry can go back on a peacetime basis, manufacturers are setting up plans and actually getting them underway for the reconversion period. Steel mills have been taking orders for postwar delivery of steel products, all of which are yet on a "when, as, and if" basis; machine tool builders are taking confirmed orders for deliveries when possible; and the automotive industry is clearing off the decks for the swing to automotive production just as soon as war orders are out of the way.

The physical job of reconverting is not much of a problem with the steel industry, since its wartime products are fundamentally the same as those of peacetime, even though in different proportions of production. Likewise, the machine tool builders find their reconversion problems not too great. The real job of reconversion comes in those industries that are making the finished war items, such as guns, tanks, trucks, aircraft, and component parts of war materials.

To cut down to the minimum the period of unemployment following V-Day, pre-reconversion must be complete. In other words, engineering, design work, and all planning must be completed before V-Day. Unemployment, after such planning and pre-reconversion activities, would last only as long as it takes to prepare final inventory counts, clear plants, recondition buildings, and install the peace product machines and equipment.

The fact that the best deliveries being quoted now on machine tools for use by the automotive industry in the manufacture of peacetime products is July and August, there is a tendency to hold back on reconversion plans. There will be a rush to reconversion on V-Day, but not much in a concrete way can be done now. The immediate postwar unemployment, however, may be quite severe unless such plans are put into effect quickly. The automotive industry currently is of the opinion that unless machine tool building is dependent only upon ability of the builders to do the work without interfering with the military program, it is

impossible for the industry to be adequately prepared for partial reconversion by March 15, 1945.

Presently, 75 per cent of the machine tools are set aside for military use, and the balance are rated for lend-lease, essential civilian use, and authorized expansion of production of regular civilian articles not classified as essential. Pre-reconversion requirements are not rated. Even if ratings are given to pre-reconversion requirements, as promised, reconversion orders will have to compete with those authorized sources, which will be difficult.

Restrictions on Non-rated Machinery Orders Amended By WPB

Washington

••• WPB has adopted an amendment to Priorities Regulation 24 prescribing restrictions on placing unrated or non-authorized orders for manufacturing machinery and similar equipment covered in List A of the regulation. It was pointed out that an unrated or non-authorized order must carry the standard certification required by PR-7, together with a statement that the order is placed pursuant to PR-24. The ultimate user of the machinery or equipment, it was added, must place the order, and a delivery date may not be specified which is earlier than actually required.

The distributor or dealer filling an unrated or non-authorized order placed by ultimate users under PR-24 may place the order with his supplier for the machinery or equipment, or he may replenish inventories of items already delivered on orders placed under PR-24, if he delivered from inventory. However, the dealer may not increase inventories on hand in this manner. Under the previous provisions of PR-24, dealers could place unrated or non-authorized orders for machinery and equipment merely to build a stock. This is no longer permitted, WPB said. The amendment also makes the regulation specifically applicable to items required for service operations, such as repair services, as well as production, WPB pointed out.

Container machinery has been re-

Currently, automotive builders are seeking authority to take adequate pre-reconversion steps in advance, utilizing personnel not fully occupied on war work. The industry wants to be allowed to schedule now for the work that will come, thus permitting an orderly transition to combined war and civilian operations on and after V-Day in Europe. This will reduce what can be a major home-front problem, where some workers will be producing to beat the Japs and others will be without employment, waiting for plants to switch to civilian output. These problems are recognized by the manufacturers, who are attempting to work them out in advance of the time that the problems actually confront both industry and the government.

moved from List A of PR-24, since Order L-332, which restricted deliveries of that item, has been revoked.

List A of PR-24 now includes the following orders: L-89 (elevators and escalators), L-123 (general industrial equipment), L-193 (conveying machinery and mechanical power transmission equipment), L-221 (electric motors and generators), L-226 (printing trades machinery), L-250 (electric motor controllers), L-298 (resistance welding equipment) and L-311 (logging, lumber and wood products, machinery and equipment).

Three Coke Batteries For National Tube Co.

Pittsburgh

••• Installation of three additional by-product coke batteries, together with auxiliary and service facilities at the Lorain, Ohio, works of National Tube Co., increasing the coke-making capacity of this plant to 1,650,000 tons annually, has been authorized, it was announced today by C. R. Cox, president.

Engineering surveys have begun and bids will be asked shortly on the construction work. Construction of the project is subject to War Production Board approval of the necessary priorities.

The new batteries will each have 59 coke ovens of the by-product type. The operation of these batteries, when completed, will add between 75 and 100 workers to the present force.

Armed Forces to Release Foundry Workers to Break Bottlenecks

Cleveland

• • • Of the 500 servicemen who are to be furloughed for critical jobs in Ohio foundries, 200 are expected to be sent to Cleveland, according to Stuart Smith, area director of the WMC.

Stating that WMC and Army officials would meet this week to decide which plants would get the extra help, and that "we're pushing production most in foundries making shell and heavy duty truck parts," Mr. Smith mentioned the following plants as the ones where help is most critically needed:

National Malleable & Steel Castings Co., Eberhard Mfg. Co., Superior Foundry, Ferro Machine & Foundry Co., Lake City Malleable Co., Forest City Foundry Co., West Steel Castings Co. and Fulton Foundry & Machine Co.

Generally, cutbacks and the reluctance of war workers who have been laid off to accept new jobs in which they will be frozen are becoming more serious factors in Ohio's employment problem.

During September and October war industries in the Youngstown area lost 2118 workers from vital plants, according to figures released this week, when demands were made by WMC officials that district companies step up production of emergency urgent items.

These plants were: Talon, Inc., Meadville, Pa., making fuses and boosters; the Salem plant of Mullins Mfg. Corp., producing 105 mm. shell and cartridge cases; and the Youngstown Pressed Steel Division of Mullins at Warren, making 60 and 81 mm. mortar shell in addition to the 105 mm. shell and cartridge cases.

In September, manpower loss in the Youngstown area was 1089, and in October was 1029, of which 678 were male workers. In Warren employment, totaling 9120 for October, by ten plants in the district is up 0.7 per cent compared with the 9056 figure for September, but down 2.4 per cent against the 9341 total for October, 1943.

Despite the fact that more than 38,000 veterans have been placed in jobs in Ohio this year, and a total of more than 72,400 were placed in the first ten months of the year throughout Ohio, Michigan, and Kentucky, representing a 120 per cent increase over placements for the same period last year, the problem is still acute.

Coinciding with the announcement of the release of service men for foundry work, Samuel J. Kornhauser, president of the National Tool Co., asserted here this week that the loss of no more than a dozen irreplaceable, expert grinders, he said, has made it impossible for his company to keep abreast with its orders for cutting instruments used in making precision gears and other parts prerequisite to the production of vital military equipment. He has made a plea for release of a few workers from the armed forces.

Released Facilities Will Be Geared To Critical War Needs

Washington

• • • J. A. Krug, WPB chairman, has established a Production Readjustment Committee whose function will be to gear resources released by war production changes to the needs of critical war programs. This committee was set up under the Production Executive Committee and working under the former will be four operating groups in WPB.

The operating groups, acting under

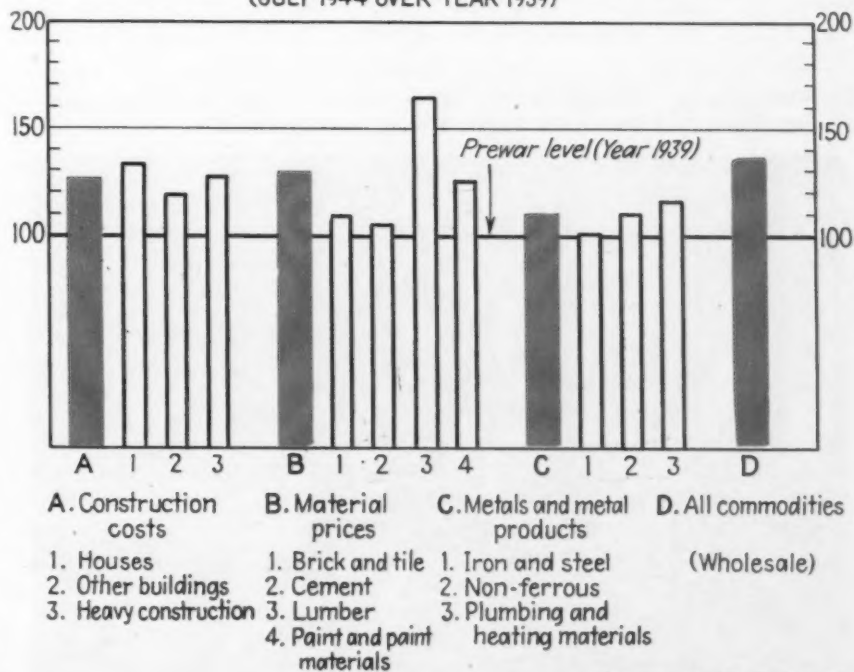
Injecting a cheerful note into the gloomy overtone of job-after-the-war, the Shell Oil Co. this week announced a postwar plan which will give jobs to employees now in service and retain present working staffs as well, predicated on the fact that petroleum, instead of serving only as a fuel or lubricant, is now the basis of new industries which will create new jobs.

Specifically the announcement cited a new process by which allyl chloride can be made from "an abundant form of petroleum material." This process, a product of Shell research, will provide allyl chloride for postwar use in plastics, pharmaceuticals, insecticides, and other products. Company officials said Shell's prewar employment totaled 28,000.

policies developed by the Production Readjustment Committee, will make certain that productive facilities and manpower released by readjustments, such as cutbacks, in the war program are used in essential war production.

The Production Readjustment Committee will consist of senior representatives of the same agencies currently represented on the Production Executive Committee Staff, including the Army, Navy, Maritime Commission, WMC, SWPC and the various operating sections of WPB. Chairman of the committee will be Arthur H. Bunker, WPB vice-chairman, with John H. Martin, WPB program implementation officer, as deputy chairman.

PERCENTAGE INCREASES—CONSTRUCTION COSTS AND PRICES
(JULY 1944 OVER YEAR 1939)



Source: F. W. Dodge Corp.

Total Surplus War Properties Inventories Amount to \$708,737,000

Washington

• • • Netting 64.7 per cent of cost or appraised value, four Government agencies, RFC, Treasury Procurement Division, Maritime Commission and WFA disposed of \$26,772,000 of surplus war property in October. The October figures, W. L. Clayton, Surplus War Property Administrator, said that they include \$4,873,000 disposed of to other Government agencies and \$686,000 for lend-lease. These four disposal agencies acquired \$270,302,000 of surplus war property in October and at the end of the month held inventories totaling \$708,790,000. Inventories held by other agencies brought the total to \$708,737,000.

The War Department continues to be the largest source of surplus war property. On Oct. 31, the War Depart-

ment had on hand property excess and surplus to its needs, but not yet reported to disposal agencies, of a value of \$510,964,000.

Included in the October disposals by the Treasury Procurement Division were: motor vehicles and parts, \$6,814,000; end products of the metal industry, except machinery and equipment, \$1,358,000; fabricated metal basic products, \$111,000; electrical machinery and apparatus, \$144,000.

Disposals by RFC included the following: aircraft and related equipment, \$2,127,000; metalworking machinery, \$1,657,000; steel, \$871,000; electrical machinery and apparatus, \$80,000; general purpose industrial machinery and equipment, \$123,000; construction equipment, \$613,000; fabricated metal basic products, \$84,000; nonferrous metals, \$28,000.

Ordnance Shipments Up in Third Quarter

New York

• • • Shipments of steel in the third quarter for such war materials as shells, bombs, guns, tanks and other ordnance materials increased according to the American Iron and Steel Institute.

Shipments to the miscellaneous and export classification which include ordnance totaled 3,277,308 tons of steel in the third quarter, compared with 3,153,340 tons in second quarter

and 3,032,040 tons in first quarter.

Shipyards received 2,321,457 tons in the third quarter, against 3,220,901 tons in the first quarter and 2,724,979 tons in the second quarter. The third quarter tonnage to shipbuilders represented 15.5 per cent of the third quarter total, compared with 20.7 per cent in the first quarter of 1944 and 19.3 per cent during the entire year 1943.

Automotive and aircraft classification received 582,054 tons in the first quarter, 499,350 tons in the second quarter and 469,607 tons in the third quarter. The railroads received 1,337,-

178 tons, equal to 8.9 per cent of the third quarter total.

Jobbers, dealers and distributors received 13.4 per cent of the third quarter total, compared with 12.3 per cent in the first half of this year and 11.4 per cent during the entire year 1943. Shipments in the third quarter of 1944 to this classification were 2,010,562 tons, compared with 1,936,371 in the second quarter and 1,848,732 tons in the first quarter.

In the third quarter, total finished steel shipments were 15,004,620 tons, compared with 15,127,001 tons in the second quarter and 15,538,984 tons in the first quarter. The decline from the first quarter was 3.4 per cent.

National Board Sets Aside Regional Order

Kenosha, Wis.

• • • A Regional War Labor Board order of March 29, 1944, involving the American Brass Co., and the Kenosha Brass Co., and Federal Labor Union 19322, AFL, has been set aside by the National War Labor Board and the case considered by the National Board on its merits.

Settling a dispute between the company and the union, the National Board directed wage rates be established for various labor grades, ranging from 85c. an hour for labor grade A to \$1.17 an hour for labor grade I. It directed that all employees now receiving more than the rate established for their labor grade shall remain at their present rates as long as they stay in their present labor grade and that all employees receiving less than the rate established for their labor grade shall be brought up to the rate. The present hiring rate of 80c. an hour was ordered continued. The wage increases are retroactive to July 23, 1943.

de Chazeau Resigns WPB

Washington

• • • Dr. M. G. de Chazeau, director, WPB Non-Military Bureau of Program and Statistics, resigned Dec. 1, to join the Committee for Economic Development in Chicago. The Committee is engaged in a study on business fluctuations for the purpose of determining a practical policy that might be applied by Government or business, or both, to maintain the possible maximum employment.

Dr. de Chazeau is a co-author of "Economics in the Iron and Steel Industry." He did the work on the price section of the book.

CONTINENTAL WEATHER: A 48 hr. rainstorm has almost completely inundated these four Yank tanks lined up in firing position.



OPA Grants Price Increases To Pittsburgh Steel and Kaiser Co.

Washington

• • • Effective Dec. 5, OPA has granted over-the-ceiling prices to the Pittsburgh Steel Co., Pittsburgh, on rods and wire products and to the Kaiser Co., Fontana, Cal., on billets, slabs, and structural shapes. OPA granted the increases on petitions from the steel companies which said that high costs made it necessary to get increased prices.

Pittsburgh Steel was granted increases over the established ceiling ranging from \$1 a net ton on rods No. 5 to 9/32 in. to \$10 a net ton on bright nails. On rods heavier than 9/32 in. the company was granted a price of \$47 a ton or \$7 over the established ceiling of \$40 and \$3 a ton more than the price of \$44 on the lighter rods, although ordinarily the

lighter rods take a differential over the heavier grades.

Kaiser's above ceiling increases ranged from \$12 a net ton on carbon rerolling quality billets, blooms and slabs to \$24.64 on shell quality carbon

blooms and billets and covered products not previously produced at Fontana. On structural shapes Kaiser was allowed a price of \$3.20 per 100 lb. compared with the Pacific ceiling of \$2.75.

Base prices granted Pittsburgh Steel, FOB Pittsburgh, and the Kaiser Co., FOB Los Angeles, compared with established ceiling prices at Pacific ports follow:

	Price Granted	Established Ceiling
Rods, No. 5 to 9/32 in.....	\$2.20 per 100 lb.	\$43 net ton
Rods, heavier than 9/32	2.35 per 100 lb.	40 net ton
Bright wire	2.725 per 100 lb.	2.60 per 100 lb.
Bright nails	2.90 per 100 lb.	2.40 per 100 lb.
Lead and furnace annealed wire	2.85 per 100 lb.	2.60 per 100 lb.
Pot annealed wire	2.85 per 100 lb.	2.60 per 100 lb.
Galvanized barbed wire	3.90 per 100 lb.	3.60 per 100 lb.
Plain staples	2.55 per 100 lb.	2.40 per 100 lb.
Galvanized staples	2.65 per 100 lb.	2.40 per 100 lb.
Bright spring wire	3.30 per 100 lb.	3.20 per 100 lb.
Galvanized spring wire	3.45 per 100 lb.	3.20 per 100 lb.
	Price Granted	Established Ceiling
Billets, blooms, slabs, carbon steel, rerolling quality	\$58.64 gross ton	\$46.00 gross ton
Billets, blooms and slabs, carbon, forging quality	64.64 gross ton	52.00 gross ton
Structural shapes	3.20 per 100 lb.	2.75 per 100 lb.
Blooms and billets, carbon steel shell quality...	76.64 gross ton	52.00 gross ton

Opening of Iron Ore Mine Next Year To Up Canada's Output

Toronto

• • • Officials of Algoma Steel Corp. Ltd. announce that the Josephine Iron Mine, which is owned by Michipicoten Iron Mines, Ltd., the latter a subsidiary of Sherritt-Gordon Mines Ltd., and Frobisher Exploration Co. Ltd., will go into production next year. Under its production program it is reported that negotiations have been completed whereby the Josephine Iron Ore will be treated in the sintering plant at the New Helen Mine of Algoma Ore Properties Ltd., which is controlled by Algoma Steel Corp. Ltd.

Josephine Ore Reserves are estimated at 3,266,000 tons of hematite, averaging 53.94 per cent iron, 15.67 per cent silicon. At the Ruth property, also owned by Michipicoten Iron Mines, the siderite deposit has indicated 28,000,000 tons, and officials believe that this can be raised to 50,000,000 tons. As the grade at the latter property runs 31-35 per cent iron, sintering would be necessary to bring the ore to commercial grade and it is chiefly this ore that will be treated in the sintering plant at the New Helen Mine, while the Josephine ore could be shipped as lump.

With the Steep Rock Iron Mines, the New Helen Mine and now the Michipicoten Iron Mines, as potential

big producers of iron ore in Canada, the question arises as to where a market will be found for all production. Steep Rock has arranged for the disposal of its ore mostly in the United States, whereas Algoma Steel's New Helen Mine which is producing upwards of 400,000 tons per year, is disposing of about half of its output in the Cleveland area and using the remainder in its own blast furnaces, but so far Michipicoten interests have not

revealed the market for their output. Consumption of iron ore in Canada for the current year will total approximately 3,500,000 tons, and includes Algoma Steel Corp. with its New Helen Mine and Dominion Steel & Coal Corp. which draws its iron ore supply from its own mine at Wabana, Newfoundland. Under these conditions it would appear that the Michipicoten Co. plans looking for a market in the United States.

TOUGH GOING: Armorers working in gum boots push a bomb trolley through a miniature lake to reload waiting Mitchell medium bombers somewhere in the European war theatre.



Industrial Briefs . . .

• **PURCHASES**—The Alderman Gage Co., Detroit, has been purchased by Herman A. Krueger, until recently general superintendent of Heidrich Tool & Die Co. The name of the company has been changed to Krueger Tool & Engineering Co.

• **EXPANSION**—Large-scale expansion of its oil well supply business is being undertaken by the Buffalo Bold Co. The company has completed negotiations for the purchase of the entire capital stock of the S. M. Jones Co., Toledo, Ohio.

• **ENLARGING FACILITIES**—The widespread use of fractional horsepower motors in wartime has required an increase in the plant facilities of Bodine Electric Co., Chicago, who have broken ground for a two-story addition, which will enlarge present capacity approximately 50 per cent.

• **BUILDING**—To make adequate provisions for immediate war requirements, the Signode Steel Strapping Co., Chicago, is erecting a building adjacent to their present plant.

• **HANDLING SALES**—Whiting Corp., Harvey, Ill., has announced appointment of Mullaney & Campbell, Seattle, Wash., as its exclusive sales representatives in the Seattle territory.

• **POSTWAR PLANNING**—Surface Combustion has purchased the building adjacent to its Columbus, Ohio, factory in preparation for substantial increases in postwar employment and production on Janitrol heating equipment.

• **REOPENING**—The Beryllium Corp. of Pa., Reading, Pa., has announced the reopening of their Chicago sales office, with headquarters at 205 West Wacker Drive.

• **CHANGES NAME**—Little Chute Machine Corp., Little Chute,

Wis., has changed its corporate name to Essential Products Co.

• **CORRECTION (Nov. 9)**—Northern Engraving & Mfg. Co., La-Crosse, Wis., purchased the land and buildings once owned by defunct Wisconsin Marine Construction Co., Prairie du Chien.

• **COMPANY EXPANDS**—Perfex Corp., Milwaukee, has plans for a \$100,000 addition to its plant there and a new boiler house to cost \$25,000.

• **ORGANIZING**—The organization of Industries Counsel Associates, Inc., with offices at 280 Madison Avenue, New York, to service industry in the field of public relations, engineering analyses of plant facilities, market research and design, has been announced.

• **OPENING OFFICES**—Dean Swift, formerly of Seattle, has announced the opening of offices in New York. He will represent the Western Gear Work's plants at Seattle, Wash., Lynwood and Vernon, Calif., and Western Gear's associate plant, the Pacific Gear & Tool Works, San Francisco.

• **AWARDED CONTRACT**—General Electric Co., Pittsfield, Mass., has awarded a contract to J. W. Bishop Co., Worcester, for a two-story, 6500 sq. ft. addition to the plastics division, main office building.

• **BECOMES AGENT**—To provide modern mechanized materials handling service to industries in the southeast, the Cameron & Barkley Co., Charleston, S. C., became the agent of the Automatic Transportation Co. of Chicago.

• **NEW NAME**—Celanese Corp. of America has announced that the name of the selling organization for its plastics products has been changed from Celanese Celluloid Corp. to Celanese Plastics Corp.

Australians Want American Capital In Postwar Years

New York

• • • American capital will be welcomed by Australians as an aid to further industrialization of Australia after the war, Sir Frank Beaurepaire, chairman of the Australia delegation to the recent International Business Conference at Rye, N. Y., and chairman of Olympic Tyre & Rubber Co., of Melbourne, said recently.

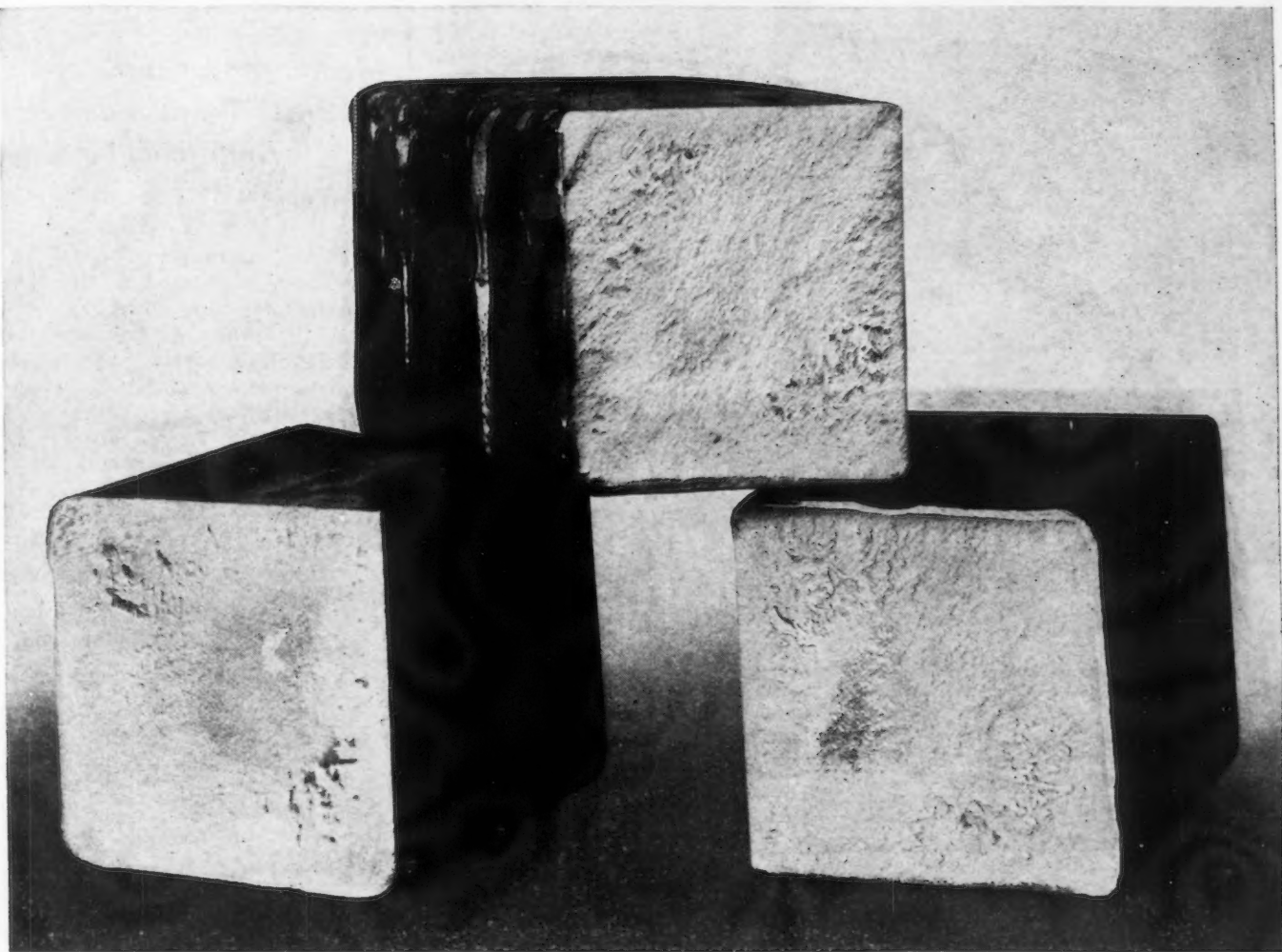
As an indication of the opportunities awaiting capital from other countries in Australia, Sir Frank told a press conference that war-time demands had advanced Australia's engineering productive capacity "by about fifteen years." This, he said, has boosted capital expenditure on land, buildings, plant and machinery in Australia beyond the billion-dollar mark.

Australians are ready to join with business men from America, on a joint-capital basis, in developing peace-time industries from this war plant, Sir Frank declared. He expressed the belief that Australia's population might easily expand from its present total of 7,200,000 persons to 25,000,000 in the next fifty years.

Motor cars are one product which, he predicted, would be made in Australia after the war, since most of their component parts are already being manufactured, and since Australia has demonstrated its ability to produce completed aircraft. Rayon is another product which will soon be made in Australia, he said.

Sir Frank said it was hoped that such enterprises would grow in number and variety, particularly as taxes are scaled down after the war. Australia's system of compulsory arbitration of labor disputes, he declared, has been accepted by both capital and labor and has produced "a high degree of stability" although during the war difficulties had arisen, as in the United States.

"Australia is looking forward to an even better basis for business relations with the United States," Sir Frank declared, observing that greater use of Australian wool and meat by the people of the United States would go far toward this objective. He said he hoped that experiments now under way, looking toward the thinning of wool fibers, would provide a greater market for woollen products everywhere.



Advantages of shearing billets over nicking and breaking—



The unretouched photo above show sections of $4\frac{1}{2}$ inch alloy steel billet cut on a Buffalo Billet Shear. Note the clean, square surface of each cut—Observe that there is no "smearing" of the metal. See how easily "pipes" could be detected in the billet. And remember, these pieces are cut at the rate of 10 per minute. With automatic feed table, production on this machine is really worth-while.

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2. Cost of gas and burner is eliminated.
3. Ends of pieces are square—no "notch" on one edge.
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Forging shops all over the World use Buffalo Billet Shears for low-cost production. Write for Bulletin No. 3295 which shows the complete line.

BUFFALO FORGE COMPANY

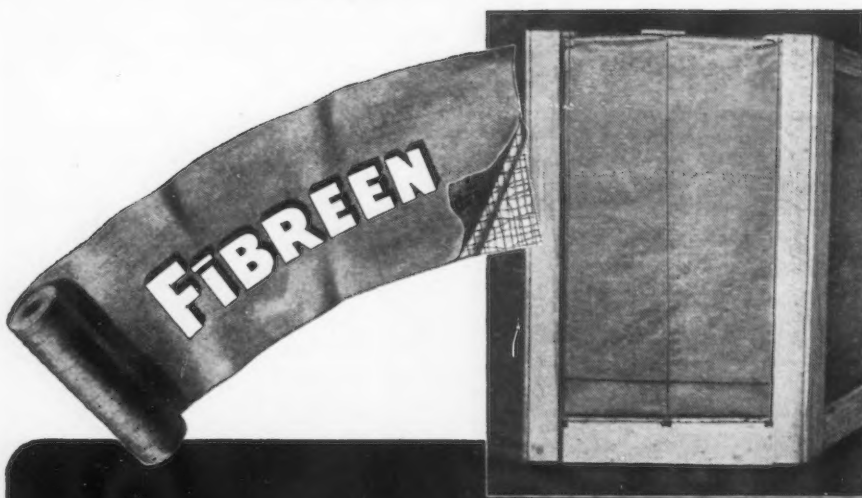
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Buffalo, New York

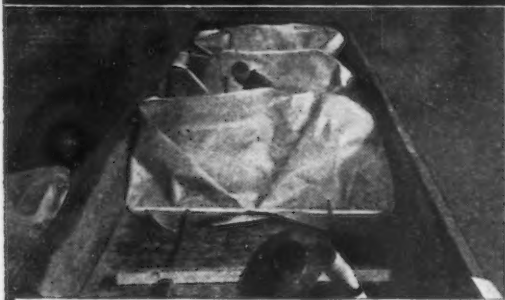
Canadian Forge & Blower Co., Ltd., Kitchener, Ont.

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Manpower Limitations Block Production Of Additional Tin Cans

Washington

••• Even if WPB granted their request for relaxation of metal can order M-81, members of the Can Manufacturers Industry Advisory Committee at a recent meeting expressed doubt that manpower will be available to produce many additional cans at present. This prospect prevailed, it was pointed out, because most of the largest can manufacturing plants are located in No. 1 labor areas, and many other can making plants are in No. 2 areas. Committee members said, however, that they favored relaxation of the order so that production can be increased as fast as workers are available.

The contemplated change in the order would permit cans for a limited number of previously prohibited items, but still retain the quota system for all products. WPB said that the recommended relaxation would be a conservative first step toward revocation, which probably cannot take place until victory in the Far East releases Malayan tin for world markets.

With steel in improved supply, the most important limiting factors in can production are now tin and manpower. The suggested change in M-81 was to a type requiring a minimum of additional tin. Coffee, shortening, paint and talcum powder are among the products that could be packed in metal, under quota, without appreciable increase in tin to coat steel cans, WPB said.

WPB Control Relaxed On Railroad Equipment Builders

Washington

••• WPB has announced that upon notification to it, railroad equipment builders who are in a position to produce locomotives and railroad cars in advance of their production schedules may do so. The manufacturer may proceed with such advance production provided it does not interfere with other production or delivery schedules or if he is not otherwise directed, in writing, by WPB. Sequence of production established in schedules must be maintained.

These provisions are set forth in amendments to orders L-97 and L-97A, which control production of new locomotives and new railroad cars, respectively.

FIRST

ROUGH TRIM

FOR A LOCOMOTIVE WHEEL CENTER

The balanced, true, smooth-surfaced piece of mechanism that is a finished locomotive driver hardly appears in this rough PSF wheel center casting, but all the raw material is there. It has the required analysis, closely controlled, and the most desirable grain structure for stamina and service. It has the necessary clean soundness and dimensional accuracy, and precision finishing will follow. These values trace back to PSF's advanced foundry practices, and to our highly modern testing, heat treating and machining facilities. They are values inherent in all castings "by PSF."



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Pittsburgh

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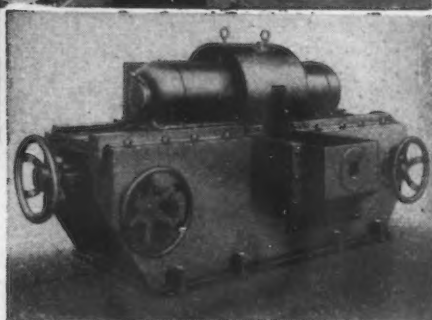
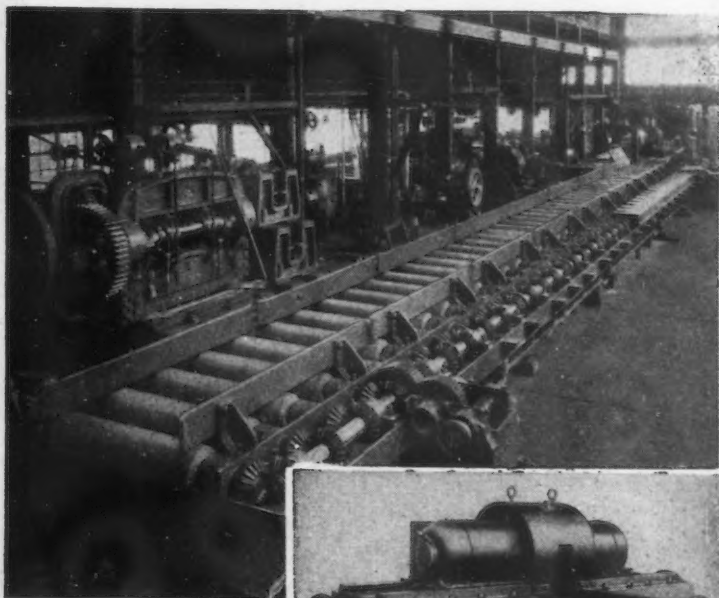
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THE IRON AGE, December 7, 1944—123

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NEWS OF INDUSTRY

Foundry Using Fork Truck for Loading Its Annealing Oven

Milwaukee

• • • It formerly required four to five hours to load an annealing oven at Milwaukee Malleable and Grey Iron Foundry Co., using a steam-powered oven charger; and another four to five hours for unloading—a full day for one complete cycle.

Today a standard fork truck of 4000 lb. capacity loads an oven in one hour and a half, unloads another in the same length of time, and has a full half day left for doing a variety of handling and hauling jobs to the benefit of operating costs.

Handling annealing pots is a problem common to all malleable iron foundry operators, and Milwaukee Malleable's problem was typical. There are the familiar annealing pots to be stacked four deep, six abreast across the oven from end to end. Ceiling height at the side is 70 inches, and the floor is covered with sand and dirt. Also, in some ovens there is the problem of tile flues in the floor.

Formerly this charging and discharging operation was accomplished by a steam-powered, steel wheeled, rear end control ovencharger. Use of this equipment required that the operator arrive two hours before the machine was to be used, to fire up and get up steam. Loss of steam during charging or discharging as well as the low speed of the truck, made each of these operations a four to five hour job. The speed of the truck and the inconvenience of the rear-end control compelled the driver to remain in the end of the oven picking up the last two rows of pots for 10 to 15 seconds in 600 deg. heat on each trip.

Careful study of the operation led to the selection of a gasoline-powered fork truck of 4000 lb. capacity and a low overall height, controlled by the operator seated in the center of the machine directly behind the load. This solution proved satisfactory. The operator was protected from direct heat from the pots by a sheet steel shield mounted behind the forks; the low overall height permitted operation against the oven side walls; the driver's position near the load gave quicker and more positive control of operation; and the speed of the vehicle kept the operator's time in the oven at a minimum.

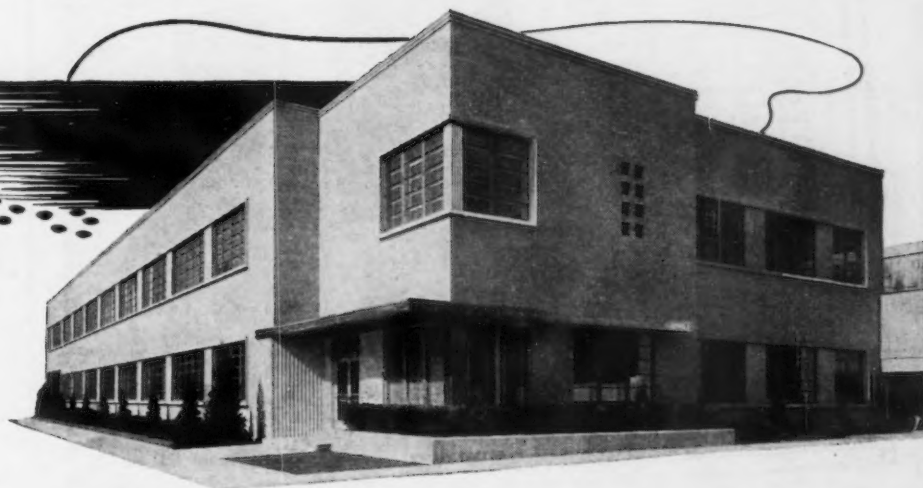
BENDING AND STRAIGHTENING MACHINES • ANGLE BENDERS

PUNCHING AND SHEARING MACHINERY

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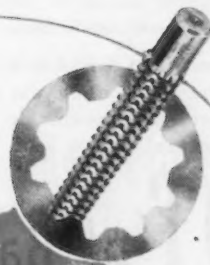


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Powder Metallurgy Developments Discussed By R. P. Koehring

Pittsburgh

• • • R. P. Koehring, chief metallurgist of the Moraine Products Division of General Motors Corp., Dayton, speaking before the Pittsburgh Chapter of the American Society for Metals recently, stated that a better knowledge of the applications of powder metallurgy, with its advantages as well as limitations, will be the basis of progress of this industry. For advantageous application of powdered metal parts, he said, design of the part must be such that it saves machining costs or yields some property impossible to obtain by other methods.

Mr. Koehring discussed the history of the industry, materials used, production and operation techniques, and applications. Currently, he said, the main applications are in porous bearings and filters, although functional parts have been manufactured. An example of the latter, the gear assembly in an automobile oil pump, has given excellent results. Some of the limitations in the use of powdered metals for making various parts are the lack of plastic flow of the powders, which limits the number and variety of shapes that can be made; the relationship between pressure required for briquetting the powders and tool wear; difficulty of extreme tolerances, with its consequent higher tool cost and shorter tool life; and the factor of directional accuracy, which is limited by the powder elasticity and press spring.

One interesting application that Mr. Koehring mentioned was the use of powdered metal, copper and nickel powders, that are used as a brazing material between steel and a lead based babbitt in the manufacture of an automobile bearing. The powder is spread on the steel to a thickness of about 0.025 in., and sintered. After sintering, the coating thickness is about 0.017 in., and the resulting coating forms an excess base for the application of the babbitt, which is cast on this porous surface. The babbitt, which is then machined down to a thickness of from 0.001 to 0.003 in., is bonded tightly to the steel backing and is reported to carry a considerably higher load than other type bearings.

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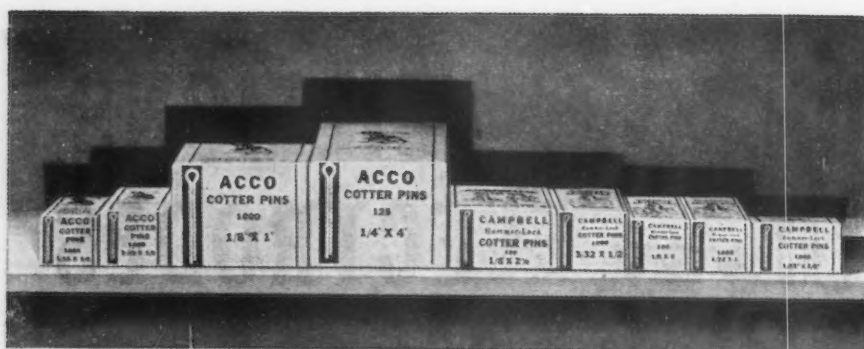


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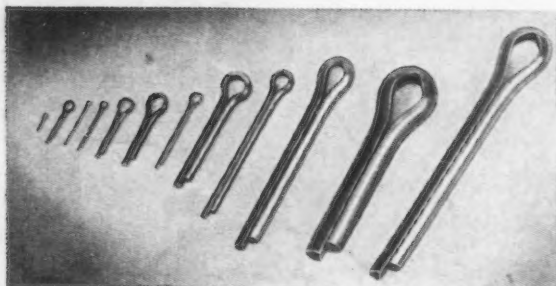
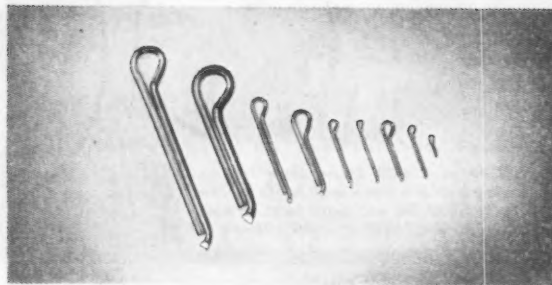
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United Air Lines Ceases Operations To Alaska for ATC

Chicago

● ● ● What aviation veterans describe as one of the outstanding jobs done by airline flight and ground crews in maintaining a military aerial supply route under difficult conditions was completed recently by United Air Lines for the Air Transport Command.

Effective immediately, at the request of the Air Transport Command, United is terminating its flights between Seattle and Anchorage, Alaska, so that it may transfer personnel from that route to the trans-Pacific operations which it helps conduct for the ATC. The latter have become increasingly important with the accelerated tempo of combat operations in the Pacific.

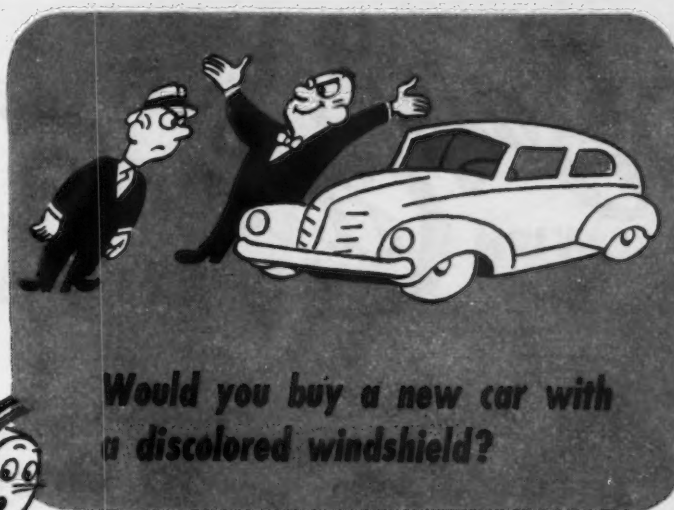
In ending its Alaskan flights, United looks back on a record of more than 5,200,000 miles flown with 16,500,000 pounds of men, material and supplies since the company first undertook the operations in the spring of 1942. That record, furthermore, revealed that the entire job had been done without a major mishap and, in the past year or so, had been accomplished with an average completion of approximately 95 per cent of all schedules.

United was one of 10 airlines credited with a vital contribution to the successful defense of Alaska during the Japanese threat there in 1942. The company's original operations were from Dayton, Ohio to Fairbanks and from Ogden, Utah to Edmonton. In June, 1942, numerous special flights were made to deliver urgently-needed men, ammunition and other materials to military garrisons along the Aleutian chain.

Flights on the Dayton-Fairbanks and Ogden-Edmonton routes were discontinued in the fall of 1942 but United resumed its Alaskan operations, this time over a 1500-mile route from Seattle to Anchorage via Annette, Juneau, Yakutat and Cordova, in June, 1943. Since then ATC planes flown by United personnel have been making routine trips over that line.

In its totals for the northern operations, United showed approximately 20,000,000,000 pound-miles flown with 33,500 passengers, almost 6,000,000 pounds of cargo and more than 2,500,000 pounds of mail.

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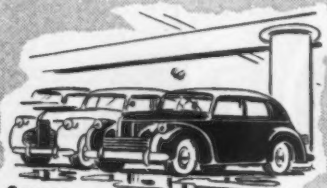
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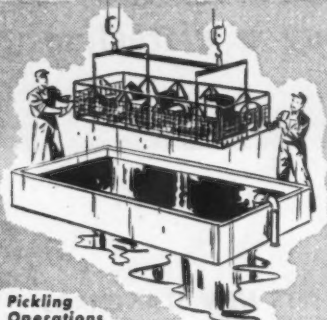
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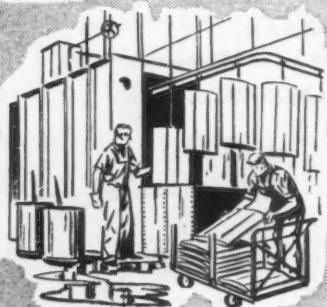
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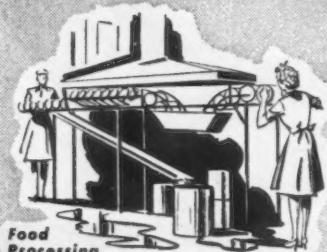
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NEWS OF INDUSTRY

York Consolidating Refrigeration Items For More Efficiency

Philadelphia

• • • A streamlined program for post-war product development and redesign will make possible a reduction as high as 25 per cent in the number of refrigeration and air conditioning items manufactured by the York Corporation, it was reported here recently.

Speaking before a meeting of the Sales Managers Assoc. of Philadelphia, W. S. Stair, director of product development for the company, declared that one of the major postwar problems of the refrigeration and air conditioning industry at present is that of simplification and reduction in number of types and sizes of equipment without loss of markets.

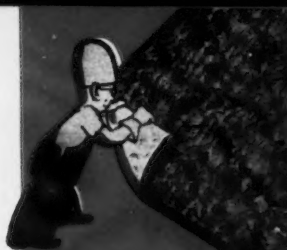
"There are some 50 major markets for our products and in order to cover these markets we build 55 different classes of commodities which, when broken down in various sizes, represent 400 different items, not including parts," Mr. Stair explained. The present policy, he said, is centered on establishing a list of postwar commodities which will include some of York's present products without change, others of the present line redesigned for lower costs, better performance and standardization and a certain group of entirely new products.

Mr. Stair pointed out that for the past year all product development operations previously handled by several different departments are now centered in one group reporting directly to the president. This group, in addition to handling product development, studies markets and marketing methods, consumer needs and acceptance and joint developments with outside manufacturers.

"As in other industries," the York executive said, "it may appear that considerable work could be done by our development engineers on certain doubtful projects which would eventually go for naught due to subsequent market studies which would make it advisable to drop a project. However, our present schedule is remarkably free from this penalty for the reason that aside from redesign it is largely devoted to component parts rather than completed packages.

"Practically every refrigeration or air conditioning system or unit which we build incorporates some type of gas pumping means and heat trans-

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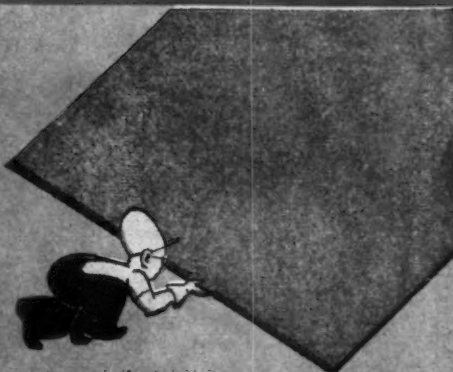
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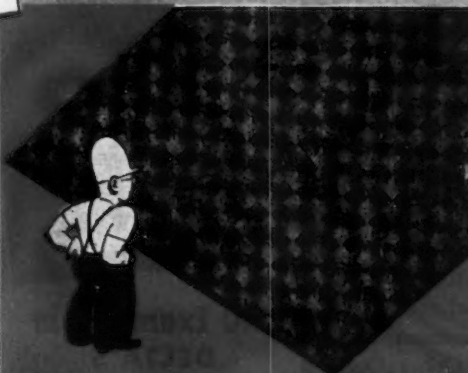
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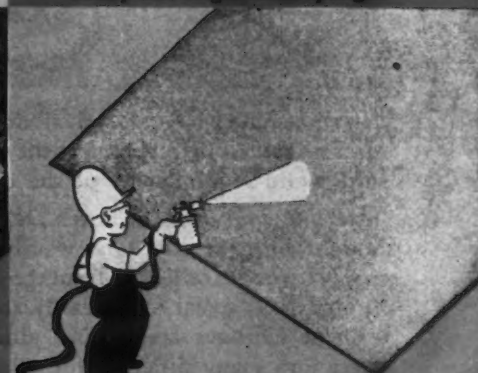
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fer surface. This is true whether it be a small portable air conditioner or a refrigerating system for a vast cold storage plant. Therefore, while our development engineers have been striving for more compact, efficient and lower cost component parts which may find use in a wide variety of unitary equipment, we have been conducting market studies which will help us to make a final decision to incorporate these components into finished models and make capital expenditures for tools and plant alterations as may be found necessary."

Boeing Announces Super Transports, The Stratocruisers

Seattle

• • • Announcement of a new Boeing giant of the skies, a double-deck post-war luxury transport growing out of Boeing's famous B-29 Superfortress, was made today by C. L. Egtvedt, chairman of the Boeing Aircraft Company.

The new super airliner, designated the Boeing 377 and dubbed the Strato-cruiser, will carry 72 to 100 passengers with extreme range and the high speeds, and will have the unprecedented low direct operating cost of 1 cent a passenger mile, Egtvedt announced. It will have an operating cruising speed of 340 miles per hour.

A military prototype of the new transport, built in secrecy, now is undergoing tests, giving Boeing very desirable experience in manufacture before the war ends. All present models of the plane will be for military service.

Egtvedt, the man who originally conceived the Boeing Flying Fortress, hailed the Strato-cruiser as a significant step in the trend of future aircraft that will make possible lower and lower fares, although with more comfort and luxury for the passenger. He feels that this will in a few years put air transportation, with all its advantages of speed and comfort, within the same price range as low-cost rail and bus travel.

The 377's performance, together with low operating cost, is accomplished by utilizing the Boeing "117" low-drag wing and other aerodynamic advancements which have been proven on the Boeing B-29, Egtvedt said. The direct operating cost of 1 cent a passenger mile, will apply to ranges as great as from the Atlantic seaboard to the Pacific coast non-stop.



Wherever in the World your product goes from the assembly line, there goes with it your reputation . . . your responsibility for its peak performance in the field.

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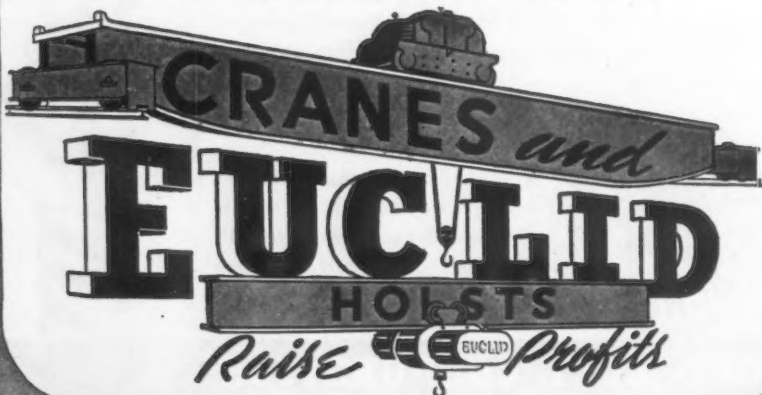
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NEWS OF INDUSTRY

Architect Debunks Some Postwar Ideas On Modern Housing

Falmouth, Mass.

••• Debunking those "star-gazers" who, he says, profess to see in the immediate postwar period homes of a shape, size and content as to be completely unrecognizable by all previous standards in this country, Architect Ernest Gunnar Peterson, of Falmouth, Mass., suggests a house design that, he believes, proves that a home can be modern both inside and outside without relinquishing intrinsic beauty and serviceability.

Having the courage of his convictions, Mr. Peterson built his house design on a knoll overlooking Vineyard Sound and now lives in it. He affirms that it substantiates all his claims for maximum "livability."

In recent months the house has attracted hundreds of visitors, among them architects, heating engineers and house contractors who have jumped at the opportunity to inspect this preview of what the home of the immediate future may contain. The fact that this architect's version of the "house of tomorrow" is located in the heart of conservative Cape Cod, where adherence to traditional architecture is proverbial, has only added to its reputation.

"I was fortunate in being able to complete this home before too many wartime restrictions were imposed," he says, adding, "I now have several years' experience to refer to when explaining the characteristics of this design. No attempt was made to be revolutionary, I merely incorporated the best materials and ideas that seem to be permanently desirable."

Mr. Peterson suggests four main trends in residence construction that, he believes the public will adopt on wide scale in the immediate postwar period. They are:

1. **Modern architecture.** Nothing too revolutionary, but a definite departure from traditional designs.
2. **Large glass areas.** This trend, he says, was well under way before the war and will be continued and expanded.
3. **Radiant heating.** It will be adopted progressively, he affirms, because it offers greater comfort and economy of operations. Moreover, he says, it is the most practical system for heating houses with huge window areas, and is the only practical solution of the problems of the basementless house.
4. **Built-in furniture,** including



MOORE RAPID *Lectromelt* FURNACES

A size "KT" Lectromelt top charge furnace with roof rotated, ready to be charged by a drop bottom charging bucket. This is one of the heavy, steel mill type furnaces.

★Moore Rapid Lectromelt Furnaces are built in a wide range of standard sizes from 100 tons down to 25 pounds capacity. Almost all of the Lectromelt furnaces installed during the past few years have been of the top charge type. The top charge feature offers many advantages, such as greater output due to decreased charging time, lower power and refractory costs, increased production per man hour and many others. Especially large pieces of scrap can be charged readily, and light fluffy scrap can be charged to shell height with a drop bottom bucket. In some of the very large sizes—frequently arranged for installation on an open-hearth platform—a door charge furnace may be used with the charging being handled by an open-hearth charging machine.

**PITTSBURGH LECTROMELT
FURNACE CORPORATION**
PITTSBURGH 30, PENNSYLVANIA



The following tables list some pertinent data on the various sizes of Lectromelt Furnaces:
TABLE I. These larger capacity furnaces are of the heavy, steel mill type and are generally used for ingot production.

Lectromelt Size	Nominal Size of Heat	Shell Diameter	Nominal Capacity of Substation
HT	75-100 Tons	20'-0"	15,000 kva
IT	60-75 Tons	19'-0"	15,000 kva
JT	50-60 Tons	18'-0"	12,000-15,000 kva
KT	40-50 Tons	17'-0"	10,000-12,000 kva
LT	30-40 Tons	16'-0"	8,750-10,000 kva
MT	25-30 Tons	15'-0"	7,500 - 9,375 kva
NT	15-20 Tons	12'-4"	7,500 - 9,375 kva
OT	8-12 Tons	11'-0"	6,000 - 7,500 kva

TABLE II. The Lectromelt furnaces listed in this table are generally used in foundry work but many of these smaller furnaces are used in ingot shops for pouring billet size ingots or for tool steel.

Lectromelt Size	Usual Hourly Production Rate	Usual Size of Heat**	Nominal Size of Substation
OPT	4½ Tons	8-9 Tons	3,000-3,750 kva
PT	3 Tons	5-6 Tons	2,000-2,500 kva
CQT	2 Tons	3½-4 Tons	1,000-2,000 kva
QT	1½ Tons	2½-3 Tons	1,200-1,500 kva
RT	1 Ton	2 Tons	800-1,000 kva
ST	1,000 Pounds	1 Ton	400- 500 kva
TT	500 Pounds	1,000 Pounds	300- 375 kva
UT	250 Pounds	500 Pounds	200- 250 kva

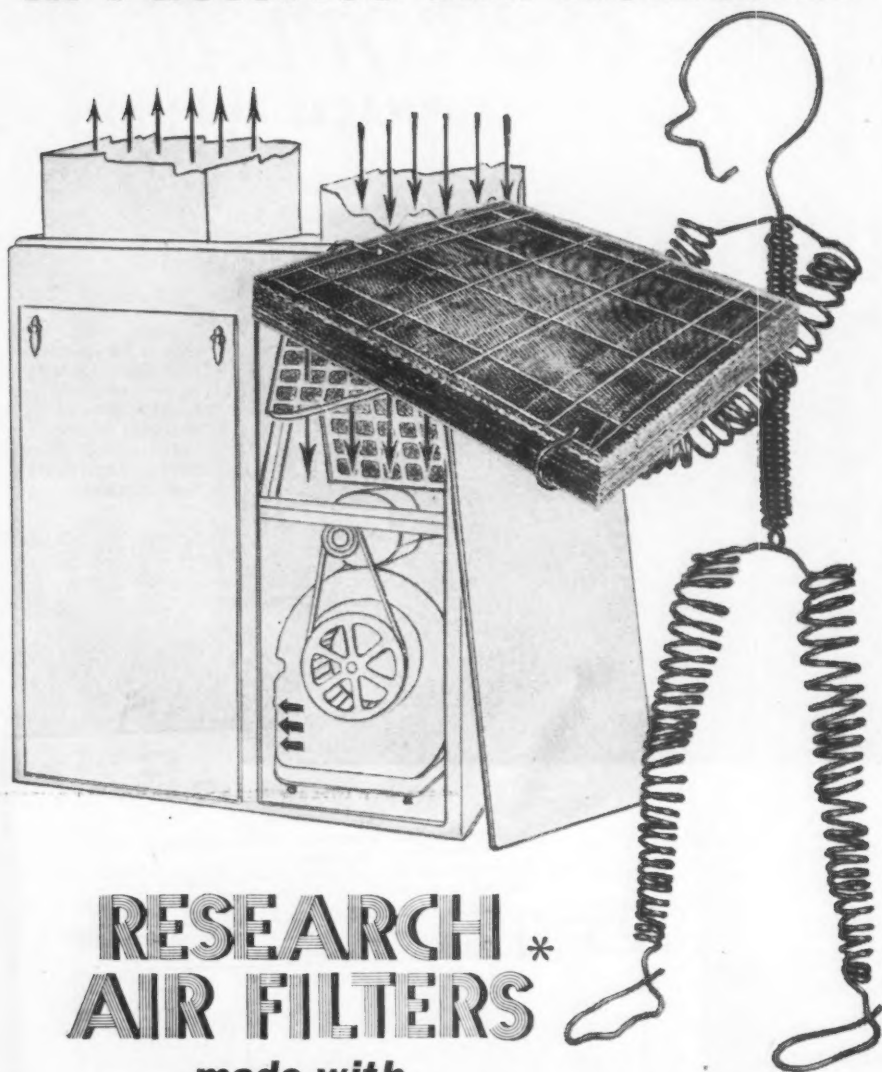
*On acid practice or single slag basic practice.

**The furnaces are so constructed that, when the occasion demands, especially large heats can be poured, considerably in excess of the "usual" heats listed.

TABLE III. The Lectromelt furnaces listed in this table are intended primarily for laboratory and experimental use. These furnaces are for operation from a single phase supply.

Lectromelt Laboratory Sizes	Usual Size of Heat	KVA Rating
V	200-300 Pounds	100
VW	100 Pounds	100
W	50 Pounds	50
X	25 Pounds	37.5

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Research Air Filters, the grids of which are made from Keystone wire, are helping guard the health of millions in war plants, factories, office buildings, theatres and homes. These efficient, economical filters remove more than 90% of all dust, dirt and lint from the air. Result . . . lung infections and diseases are greatly reduced . . . manufacturing processes are improved.

We are indeed proud that Keystone wire used in this way is helping contribute immeasurably to the health and productive capacity of the nation.

*Research Products Corp., Madison 3, Wisconsin

KEYSTONE STEEL & WIRE CO., Peoria 7, Illinois



bookcases, buffets, bedroom shelving, even davenport.

Believing these trends will be felt immediately after the war, Mr. Peterson designed his house accordingly. It is modern, with flat roof sections that serve as sun decks and porches. The house has concrete block walls on the first floor and red cedar clapboards for the second story.

Window areas in all the rooms are large by traditional standards. For example, the glass area in the living-dining room totals 203 square feet. Unglazed outside wall area is only 255 square feet. One bedroom has 320 sq. ft. of window area and only 156 sq. ft. of unglazed outside wall.

Temperatures in the area where the Peterson home is located frequently drop below zero, so this architect's advocacy of large window areas is not restricted to postwar houses built in warm climates.

The radiant heating installation at the Peterson home is the floor slab type, both upstairs and down. Despite the exposed type of architecture and the fact that the house is swept by ocean breezes on two sides, the architect affirms:

"I am continually amazed at the low thermostat settings necessary for comfort. After experimenting, I find that in the bedrooms a setting of 60 to 62 deg. is very satisfactory. In our living room, where we have the greatest amount of exposed glass, a setting of 68 deg. is required for comfort of all members of my family.

Mr. Peterson's experience with a floor-type radiant heating installation during extremely cold weather is significant. "The system responds quickly to sudden temperature changes," he states, "and at no time have we found floors uncomfortably warm, even when outside temperatures dropped to 15 deg. below zero."

Fuel economy is another principal advantage of radiant heating, according to Mr. Peterson, who says: "I was amazed to find that we had 300 gallons of oil left over from the winter's ration, having used but 1400 gallons of the 1700 allotted to us."

The Peterson house consists of six rooms, a large hall, and two baths on the second floor. The first floor is made up of a studio and reception room, coat room, lavatory, laundry and boiler room. There is an open carport accompanying.

The boiler that furnishes hot water to the radiant heating coils is located in a small utility room on the first floor.

The first floor radiant heating coils

The JIGMIL has proven to be a totally new approach to the problems of economical precision BORING and milling of tool and production work

THE fastest producing and most accurate machine in the field.

Many users are reporting consistent experience of two to three times the output and higher quality work.

Automatic positioning of spindle from one location to another in response to measuring rods and push buttons to within less than .0001 (one ten-thousandth part of an inch).

Feather touch, pressure controlled slide locks that positively control locking uniformity, so essential to high precision work.

Unique operation and controls that make possible high precision work with relatively little skill.

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YOUR
WORK**

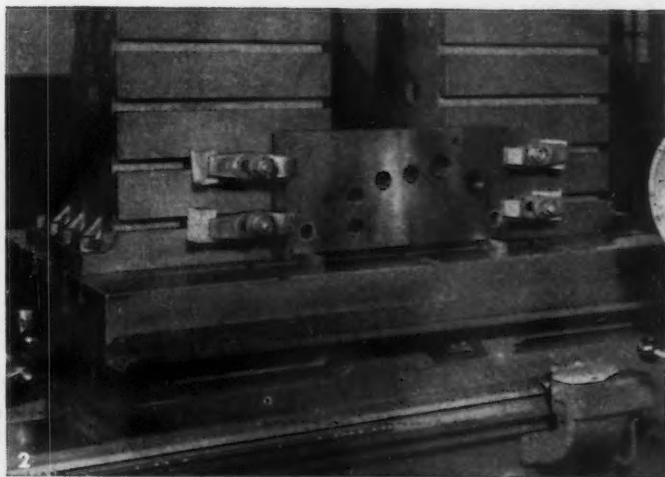
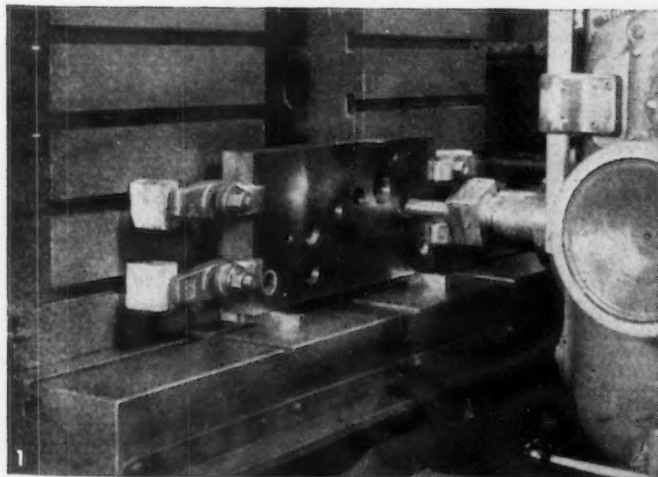


JIGMIL—The world's finest BORING and milling machine is made in Detroit.

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★ No. 1—Illustration showing convenience of jig plate boring. No. 2—Eight holes precision bored. Holes spaced within .0001 with total dependence of all spacing on automatic positioning means.

DeVLIEG MACHINE COMPANY

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JIGMIL**

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(Detroit) MICH.**



RESEARCH - Basic Reason for Better Carbides

Years of unrelenting research by Philip M. McKenna resulted, in 1937, in the discovery of the hardest man-made material—a unique intermetallic compound, tungsten-titanium-carbide, corresponding to the chemical formula $WTiC_2$. This compound is the basic ingredient of steel-cutting compositions of Kennametal. It distinguishes them from all other cemented carbides.

Introduced in 1938, Kennametal quickly became established as the tool material that made possible machining of hard steel, accurately, at greatly increased speeds. Kennametal's spectacular performance in this field was a tremendous stimulus to increased research activities, which since 1938, have led to the successful development of:

- a series of Kennametal compositions, of varying degrees of hardness, strength, and toughness, exactly suited for machining various types of steel, as well as tough, stringy non-ferrous alloys.
- a new, highly abrasion-resistant tungsten carbide Kennametal composition that cuts cast iron at greatly accelerated rates, with amazing tool life.
- a complete line of machining tools, designed to make fullest utilization of possibilities inherent in Kennametal compositions.
- Kennametal lathe files, that outlast steel files up to 200 times, and produce a superior finish.
- a wide variety of wear-resistant products, including lathe and grinder centers, pump valve balls and seats, gage tips, etc.
- negative-rake carbide milling cutters, notable among which is the widely used inserted-blade Kennamill step-cutter.

Research—looking to still further improvements in the properties and applicability of Kennametal—will continue, and expand, so long as the useful products of inventive genius are protected under an uninhibited American system of free enterprise



NEWS OF INDUSTRY

consist of 800 ft. of 2-in. wrought iron pipe on 24-in. centers, laid on a gravel fill. The second floor layout uses 800 ft. of 1½-in. wrought iron pipe on 12-in. centers, the coils being laid on prefabricated concrete joists. All coils are the spiral type, and were fabricated and welded at the site. The concrete slab for each floor was poured directly over the coils.

Built-in furnishings, the fourth innovation that Mr. Peterson believes will be incorporated in many postwar houses, are amply illustrated in the architect's home. It has the usual kitchen and bathroom cabinets and, in addition, a dressing table has been built into one of the bedrooms. The wall separating living room and dining room, is unusual. On the living room side of this wall a bookcase has been built in. The opposite side is a dining room buffet containing drawers at the bottom and cupboard space above. A settee has been built into one corner of the living room, and most of the desks and compartments in the first floor studio are built-ins.

Inventory Planning Before Termination - Discussed in Book

Chicago

• • • Pre-termination inventory planning is outlined in an instructional booklet prepared by the Chicago Ordnance District for distribution to its prime contractors.

In a campaign to eliminate a major delaying factor in the settlement of terminated war contracts, the district offers a system based upon a careful study of the best physical inventory systems used by industry. The booklet devotes considerable space to simplifying instructions on the preparation of new termination inventory forms issued by the Office of Contract Settlement.

Urging contractors to determine parts costs and work-in-process costs at the earliest possible date, the booklet goes on to offer practical suggestions for preparing inventory schedules in advance of the actual termination.

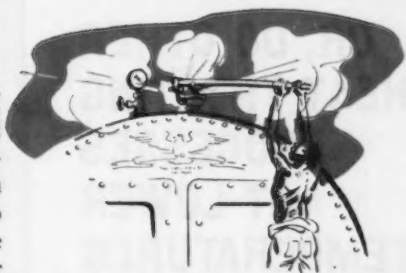
"If a contractor follows this system, he will be in a position on termination day to present a prompt and intelligent claim to the government simply by counting the inventory on hand and multiplying the unit cost by the count," states Henry P. Isham, chief of purchasing, termination and renegotiation policy for the district.

HOLDING DOWN THE SAFETY-VALVE WAS A DANGEROUS WAY TO GAIN POWER AND SPEED!



In the old steam-boatin' days when skippers and their craft raced one another on the Mississippi, some of them would resort to having a husky negro deck-hand hold down the safety valve on the boiler — to gain added power and speed. A dangerous practice, of course, that frequently resulted in disaster for skipper, steamboat and crew.

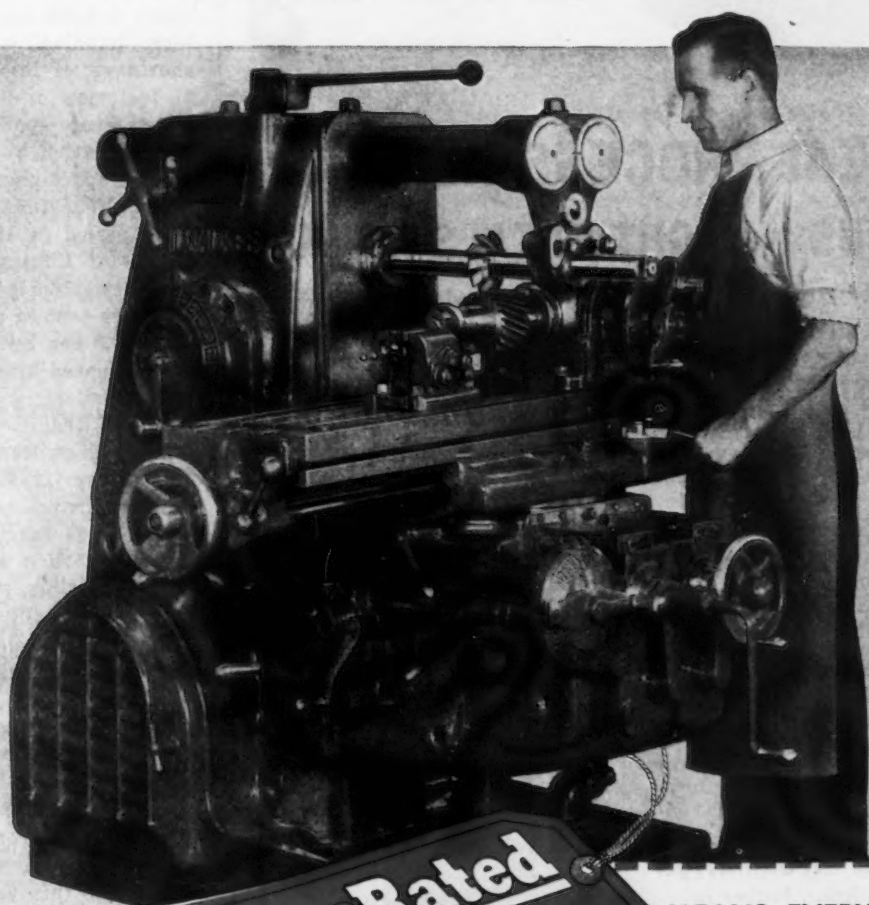
An equally doubtful expedient in machine-tool operation is the practice of substituting a higher hp motor above that normally specified for a particular class of machine. When you buy a milling machine, arbitrarily stepping up the motor hp to gain added power and speed is unsound. The power may be excessive and out of balance with its design, construction and proper range of performance.



It's an undesirable and unnecessary expedient when you know you can get milling machines — power-engineered — amply powered and properly engineered for every class of job.

Designed and built for precision performance with balanced power, Milwaukee Milling Machines are PowerRated—every machine has a definite power rating with ample reserve for all overloads normally encountered within its field of job application. You can always be sure of ample and correct motor power in every power-engineered Milwaukee.

When you are considering the purchase of a milling machine — think in terms of motor hp for heavy cuts, feed and speed range for light cuts. Check all the advantages of Milwaukee PowerRated Machines for your specific needs.



3K Universal Machine —
gashing slab milling cutter.



KEARNEY & TRECKER
CORPORATION

MILWAUKEE 14

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**MEANS EVERY MILWAUKEE
MACHINE IS POWER
ENGINEERED TO DO THE JOB**

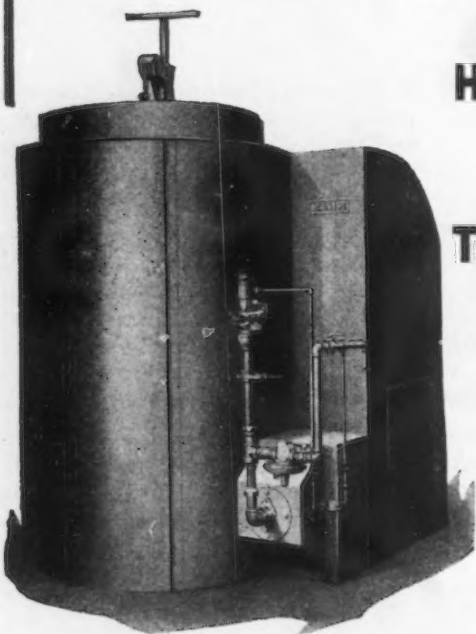
Milwaukee PowerRated Milling Machines

- Standard Models — Horizontal, Vertical and Bed Types — available in Motor ranges from 3 to 25 hp
- C.S.M. (Carbide Steel Milling) machines 20 to 50 hp
- Special Machines—Consult K & T Engineers.

Milwaukee Machine Tools

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OR, DO OTHER HEAT TREATING PROCESSES AT LOWER TEMPERATURES



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CYLINDRICAL —
ADAPTABLE FOR
PIT — CAN BE
USED FOR SALT POT

MAHR HEAT PROCESSING UNIT For FERROUS and LIGHT METALS WORK

Here's versatility in this MAHR convection heated, cylindrical heat processing unit. Gas or oil fired. Efficient burnering supplies a flood of heat within the heater which is distributed evenly and uniformly to the basket or salt pot in the heating chamber by a MAHR high temperature fan.

This unit is built for air drawing at 1250° F. or other heat-treating of either ferrous or light metals at lower temperatures. Made in nine standard sizes. The smaller sizes can easily be used on the floor, and the larger sizes may be pitsunk for easier access.

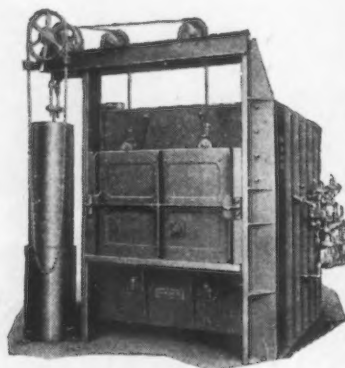
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Railroads Handling Unprecedented High In Passenger Miles

Chicago

• • • Railroads are now handling about two and one-half times the amount of freight traffic and more than four times the volume of passenger business than they did before the war, the Car Service Division of the Association of American Railroads said in a report recently.

"They are carrying," the report added, "virtually double the load of the first World War, and they are doing it with one-fourth fewer freight cars, about one-fourth fewer passenger train cars, and one-third fewer locomotives than in 1918. The reduction in freight cars alone amounts to about 600,000 units. The traffic has been handled without serious car shortages, or loss of production time at factories, or loss of foodstuffs, on account of spoilage, for want of transportation by rail.

The report pointed out that in the first half of 1944 compared with the same period in 1939, there were increases of 153.4 per cent in revenue ton-miles, 114.5 per cent in ton-miles, 350.3 per cent in passenger-car miles, and 223.2 per cent in the amount of freight moved by rail to various ports for export.

One of the most serious problems facing the railroads is the handling of passenger traffic. Excluding commutation travel, railroads in the first half of 1944 carried 21,854,000 more passengers than in the same period last year while passenger miles increased 7401 million.

"The total revenue passenger miles, including commutation, for the first six months of 1944," the report added, "were four per cent greater than for the entire year of 1920, which was the peak prior to this war."

Requirements of open top cars for coal, coke, ore, iron and steel as well as finished military impedimenta have been heavy this year. By reason of the increased loading of slightly more than three tons per car in 1944 compared with 1927, the report said, a greater tonnage of coal has been transported by rail in the first 40 weeks of 1944 than in any previous corresponding period.

"New records in the volume of movement or distribution of coal," the report added, "have been established during the current year. Among these is the dumping of 42,601,744 net tons over the lower Lake Erie docks up to



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Moly Shovels are normally made in all types, styles and grades needed for every variety of industrial use. Learn to know Moly, unconditionally guaranteed to out-wear and out-last any other shovel made.

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SPRING MOUNTED IS THE ANSWER!

For shock loading or where very heavy loads must be handled on Roller Conveyor, Mathews Spring-Mounted construction should be considered. Spring-Mounted Roller Conveyor is made in three styles, and is establishing service records in heavy industries all over the United States and Canada. Your Mathews Field Engineer can explain how it works and why the Mathews design is superior to other available types of Spring-Mounted Roller Conveyor. He can tell you how its application has minimized the costly maintenance which is usually necessary on Roller Conveyor used under very severe conditions. You will readily understand how the principle of pre-compression protects the bearings and axles of the rollers, yet, at the same time, prevents any bouncing action from taking place. Descriptive literature is available on request.



Mathews Conveyor Company
ELLWOOD CITY, PENNSYLVANIA

NEWS OF INDUSTRY

Sept. 30. This is the largest coal tonnage ever dumped in any corresponding period via the lower Lake Erie ports. The total dumpings of coal for the year over these several docks, barring the unforeseen, will, at the close of navigation on the Great Lakes, establish an all-time high record for any one year."

100 Octane Rated Gas To Be Used Primarily For Postwar Aviation

Pittsburgh

• • • Gasoline of 100 or 100-plus octane rating, now used in Allied fighting planes, will be used only in the field of aviation in the early postwar years, a report on the super-fuel predicts. An article, "High Octane Fuel—Its Production and Significance," appearing in the current issue of the *Westinghouse Engineer*, a technical magazine published by the Westinghouse Electric & Mfg. Co., stated that production limitations alone would prevent civilian automobile use of the high powered fuel.

"Prewar daily consumption of regular gasoline was 1,700,000 barrels a day while present capacity production of high-octane fuel is more than 500,000 barrels daily with the prospect of decreased production after the war," the article reveals.

"Military, commercial and private flying will use all the high octane gas of 100 or 100-plus rating. The motorist, because of the development of super fuels, will find his postwar gasoline ranging from four to six octane number above the rating of the corresponding prewar fuel."

The 1942 model automobile engines with highest compression ratios required fuel no better than 80 octane. To have a fuel better than the engines can use advantageously is as wasteful as to have engines better than the fuel available.

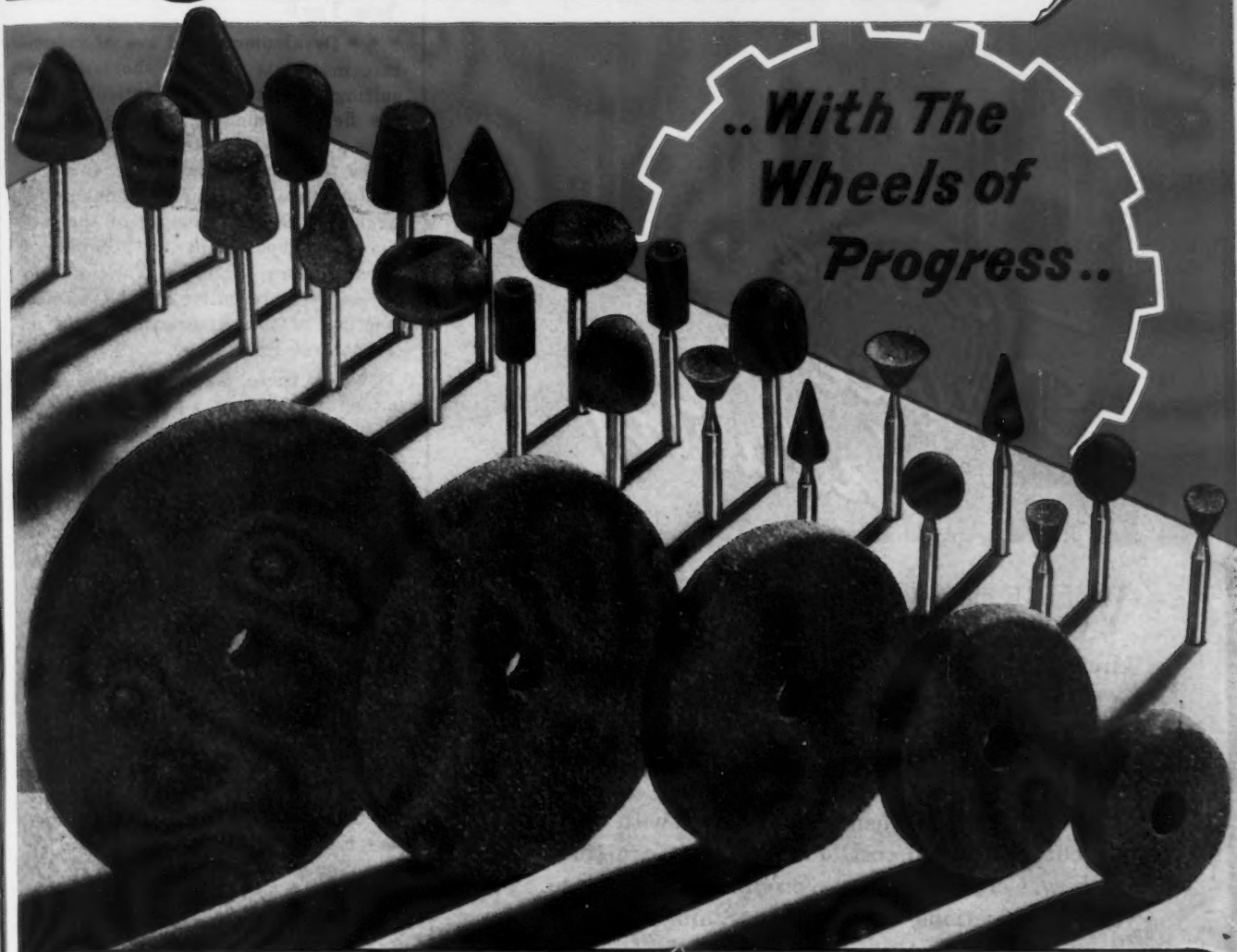
Motor car engine usage of 100-octane gasoline is likely to be many years distant. The sleek, lightweight, supercharged, high compression rear-engine car, giving 40 miles per gallon is for the future.

The report was optimistic about future developments for both fuels and motors for automobiles, pointing out that engineers would continually strive to reach the theoretical limits of gasoline mileage—now set at 250 miles per gallon—through the design of better engines and the production of increasingly higher powered fuel.

FORWARD



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Wheels of
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Constantly tested, constantly improved—Chicago Wheels produce finishes so perfect they pass exacting surface analyzer tests, so accurate they can be measured in micro inches.

Production of civilian goods will demand the same precision finishing methods.

Keep pace with Chicago, the Wheels of Progress!

CHICAGO GRINDING WHEELS

Anything up to 3" in diameter in various grains and bonds, including FV, the sensational new bond with a pedigree.

CHICAGO MOUNTED WHEELS

Shapes and abrasive formulas to take care of every job of internal or external finishing.

TRY ONE FREE!

So you'll know what they can do, we will send a test wheel. Tell us material you'd like to finish and size wheel required.



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Substitute Materials In the Metals Field Require Postwar Study

New York

• • • Development and use of substitute materials to meet shortages resulting from the war, particularly in the field of metals, will necessitate close study by industry in the postwar years to determine which of the new products are of permanent advantage, Archibald Black, manager of the mechanical department of Simmonds Aerocessories, Inc., New York, said in an address recently at the annual meeting of the American Society of Mechanical Engineers.

"When these war shortages have passed into history, a condition that is very close to attainment already, we may expect to see extensive jockeying for position on the part of producers of widely different materials," he declared.

"No longer does the designer accept any field as apportioned off to one material or another. Carbon steel, alloy steel, aluminum, magnesium, zinc, copper, nickel, wood and a long list of synthetics have all become direct competitors in many cases. In some cases the substitutions have come to stay, for unexpected advantages have resulted; in others we will revert to the time-tried ones; in still others it may take years to decide which wins out. Some materials are naturals for certain applications, just as others are inherently substitutes and still others are thoroughly satisfactory alternates deserving of equal consideration."

He warned that failure of a designer to survey the new materials carefully, letting past custom be the guide, may allow a competitor to secure a great advantage.

Discussing further some of the new developments, Mr. Black said: "The developments of the past ten years have included new methods of heat treating that revolutionized the hardening of steel. It is now possible to greatly improve the ductility of steel without loss of strength by merely interrupting the quench and holding the metal at a suitable intermediate temperature until its transformation is complete. By another method, alternately heating steel and cooling it to sub-zero temperatures, it has been found possible to produce gage blocks that do not require aging. Great advances have been made in the strength of cast iron and cast steel. Cast iron can now be rendered malleable by

P.S. 300-4

NOW IS THE TIME-

TO PREPARE FOR STORAGE OF WAR MACHINERY

*Houghton is ready with
rust preventives that
exceed the "specs"*

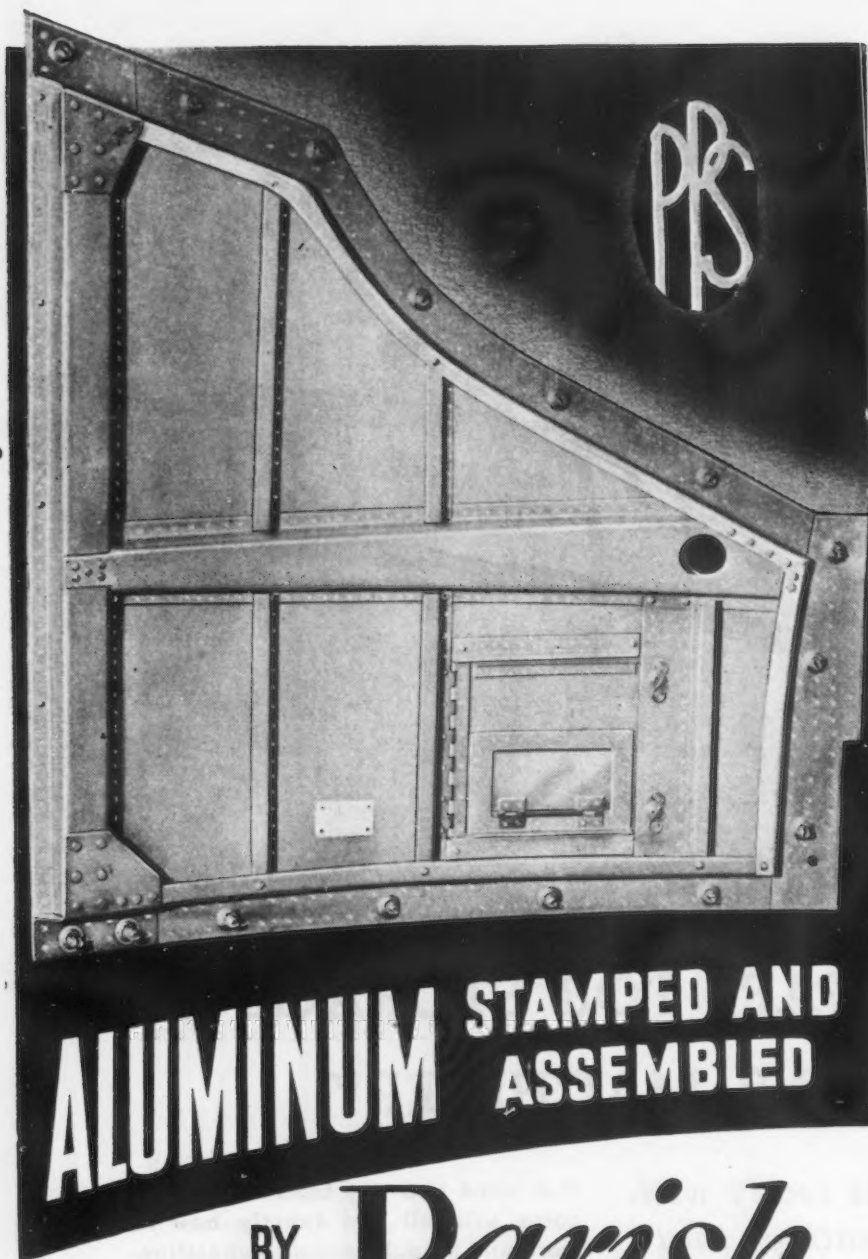
If you wait till contracts end or are suddenly cancelled, you will have trouble getting quick deliveries of lumber, paper, and the required rust preventives. Yet your equipment must be protected before you move it out to make room for peace-time manufacturing.

Now is the time to make plans for stand-by or extended storage or shipment of machine tools, presses and other equipment you will no longer need after V-E Day.

P. S. 300-4 and any later revision to come will tell you exactly how to store and ship. It includes specification rust preventives to be used, and E. F. Houghton & Co. can supply you with approved products to meet those "specs".

Our rust preventives, on which we've had a praiseworthy record for seventy years, are made to exceed, not merely meet, government requirements. Should you have a rust problem not coming directly under packaging specifications, take it up with our Metal Research Department. E. F. HOUGHTON & CO., 303 W. Lehigh Avenue, Philadelphia 33, Pa., and all principal cities.

Houghton's **RUST** *Preventives*



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Rigid adherence to specifications, speed of production and low cost feature Parish Aluminum Stampings. From preliminary design to finished assembly, every detail is handled in the Parish plant. Discuss your parts and assembly requirements with Parish engineers to determine how metal stampings may help you achieve greater production at lower costs.

Modern Design at Low Cost

Parish Pressed Steel Co.

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Western Representative: F. Somers Peterson, 57 California St., San Francisco, Calif.

including a small amount of lead in its composition and lead is also being added to steel to improve its machinability without injuring its other properties.

"Some of the powerful new magnetic alloys are ductile and some magnetic alloys show great improvement when heat treated in a magnetic field. Some new aluminum alloys have over one-third more strength than the ordinary steel of 20 years ago. Magnesium, which is still lighter, has now appeared as a serious competitor for light, strong metals. The mythical story of heat-treated copper of the ancients has become a reality today since it was discovered that beryllium copper can be heat-treated to show a tensile strength of 200,000 lb. per sq. in., bringing it up among the stronger of the steels.

"Tungsten carbides and some other carbides cemented together with cobalt have revolutionized the machining of metals. This type of metal is so hard at high temperatures that milling machines are being driven until hot chips of cut metal fly like sparks from a grinding wheel. Calcium, indium and lithium are now produced in metallic form for metallurgical and other uses."

Cherbourg Terminal Now Operated Under Former Railroaders Louisville, Ky.

• • • Cherbourg Terminal, one of the busiest rail terminals on the European continent and one of the most important to the success of the Allied armies, is now being operated by an L. & N. Railroad-sponsored outfit, according to the November 1944 issue of the L. & N. Magazine. Most of the officers of this railways battalion and a number of the enlisted men are furloughed employees of the Old Reliable.

The L. & N. outfit is now handling all the necessary switching in the Cherbourg Terminal, and attends to such related work as the maintenance and manufacture of equipment, track repair and construction, and messing, housing and supply. In their duties they have the assistance of French civilian laborers. In one 15-day period recently the battalion set a local record handling eastbound 199 trains consisting of 1582 loads and 1280 empties for a total tonnage of 46,432, and westbound 138 trains consisting of 502 loads and 421 empties for a tonnage of 14,817.

VITA-VAR RECEIVES ARMY-NAVY "E" HIGHEST PRODUCTION AWARD!



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conception of paints and coatings — greater beauty, durability and protective qualities.

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The Ruthman engineering staff are continually conducting experiments and research toward new developments and improvements in

GUSHER COOLANT PUMPS



Gusher Pumps
Patented and
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Model 11020-A

The new Gusher models are so efficiently adapted to the latest type machines and are so advantageous in operation that many plant engineers are re-designing their machine-tools to include these new-model Gushers. By actual test these newer type Ruthman pumps, like their predecessors in the Gusher line, have proven their superiority.

Plant managers and engineers who have an eye to the future specify Gusher Coolant Pumps when they want to be assured of an improved coolant system.

Write for new catalog, indexed for ready reference. Remember, there is a Gusher model and type for your special needs.

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The "Gusher"—A Modern Pump for Modern Machine Tools

NEWS OF INDUSTRY

Veteran's Apprentice Training Program Is Now Being Arranged

Washington

• • • Wages earned by veterans who qualify for apprentice training will be supplemented by the monthly allowances provided by the "G. I. Bill of Rights," Paul V. McNutt, chairman of the War Manpower Commission, announced recently in making public a report of the Apprentice-Training Service of the War Manpower Commission. The report stressed the advantages of such payments to veterans wishing to build up their earnings during the initial years of industrial training.

To date, approximately 600 veterans have taken advantage of apprentice training, but an increasing number are being enrolled and as many as 200,000 veterans may eventually apply, Mr. McNutt said. Fewer than 100 of the veterans now enrolled have applied for and are receiving the monthly allowance provided.

One of the reasons advanced by the Veterans' Employment Service of WMC for the small number of veterans thus far taking advantage of the training offered is the many jobs open in war industry that veterans are filling. At the end of hostilities, however, when there are large-scale cutbacks in war plants, WMC expects more and more veterans to enter apprentice training.

Among the applicants will be those who did not have a chance to learn a trade, and those who started training but were taken into the armed forces before completing it, Mr. McNutt said. If the veteran was not over 25 when he entered the service, he is regarded as having had his training interrupted. If he was over 25 when he entered the service, he must submit evidence to prove his training was interrupted, before he becomes eligible for training.

The Apprentice Training Service has placed stress on the enrollment of young men under 25. All veterans, regardless of age, will be given opportunity for all-around education, ATS training representatives said, and those who had already started training before the war will be placed so that they may resume their training where they left off.

The G. I. Bill of Rights authorizes the Veterans' Administration to supplement the veteran apprentice's wage with a subsistence allowance of

WE'D LIKE TO WRING TOJO'S NECK ... THIS WAY



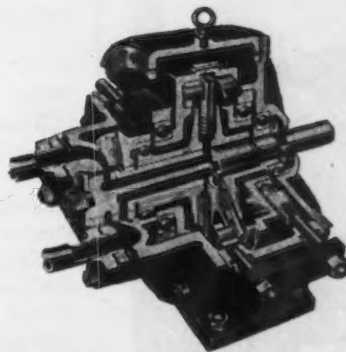
A typical application for HELE-SHAW FLUID POWER

YES, if we had our choice of means for wreaking vengeance on Tojo, this "Twister Stretcher" would get the call. It's a right handy "little" gadget (109 feet long) used in certain essential plants for taking the kinks out of structural aluminum shapes and bars.

The operator slips in an I-beam, channel, or angle and with push-button ease exerts up to a 350-ton pull on the shape, twisting it at the same time to remove any distortion.

The stretching pressure is supplied by Hele-Shaw Fluid Power generated by a Hele-Shaw Pump. Smooth stretching action and ease of control characterize the operation. Hele-Shaw Fluid Power might be equally effective for a current or future application you have in the back of your mind...for stretching, squeezing, pushing, pulling, lifting, tilting, and a long list of similar operations. Want to find out?

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OTHER A-E-CO PRODUCTS: TAYLOR STOKERS,
MARINE DECK AUXILIARIES, LO-HED HOISTS

AMERICAN ENGINEERING COMPANY

2430 ARAMINGO AVENUE • PHILADELPHIA 25, PA.

THE IRON AGE, December 7, 1944—149

\$50 to \$75 per month, depending on whether he has dependents. The combined earnings may not exceed regular wages in the trade for which he is training, however.

There are more than 100 skilled occupations in manufacturing and construction industries for which men are trained through apprenticeship.

Willys Demonstrates Possible Industrial Uses for War "Jeep"

Toledo

• • • A test demonstration of more than a dozen new postwar industrial uses for the "Jeep"—from operating plant power tools to bulldozers—was given directors of Willys-Overland Motors at the company's plant here by Charles E. Sorensen, president.

Most of the activities were handled by Jeeps which have been on test in the Willys plant 24 hours daily for the past two years. Others, however, were performed by a Jeep equipped with a power take-off and especially adapted for industrial and agricultural uses.

The demonstration was the second in a series of "previews" being conducted for directors of the auto concern to illustrate the postwar possibilities of the Jeep. Recently, the farm uses for the vehicle were displayed for Willys officials at Mr. Sorensen's farm near Detroit.

Although the showing was private, Mr. Sorensen revealed that the company's new version of the Jeep provided power for such diversified tasks as spray painting, welding and sawing lumber, and also operated air-compressor equipment for chipping and riveting hammers, paving breakers, grinders, clay diggers, rock drills, wood borers and other industrial tools.

Numerous other uses for the Jeep as a versatile and mobile factory power plant were demonstrated. Among other factory tests demonstrated were light delivery work, hauling of loaded "dolly boxes" and trailers, and the towing of a 14,280-pound trailer unit. The latter job, which requires 63 horsepower, was handled by Jeeps with the smoothness of a diesel locomotive.

The company's bright-red fire Jeep, which mounts a 500-gallon per minute pump operating off the engine, fought a "mock" plant fire with columns of water, pumped from a nearby stream, climbing six stories in the air.

Greater Tonnage
Per Edge of Blade



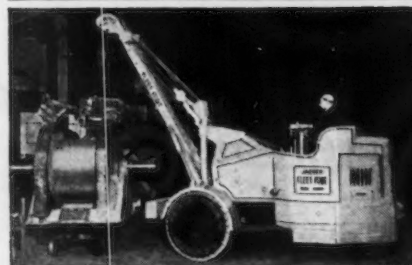
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"FLEET FOOT"

Shop and Yard Crane

5 TONS CAPACITY



Telescopic 12-18 ft. boom (or tier loader if desired) lifts up to 5 tons, swings full load 90° to either side without outriggers, totes it at speeds to 12 m.p.h. Turns in 10½ ft. Can spot cars, pull loaded trucks.



COMPACT:
Passes 6½x8 ft. door

Up to 6500 lbs.
drawbar pull



TRUCK LOADER:
Backs, swings,
lifts simultaneously,
speeds loading—
¾ to 1½ yd. buckets
to suit material.



Magnet
Attachment



Climbs
Steep Ramps



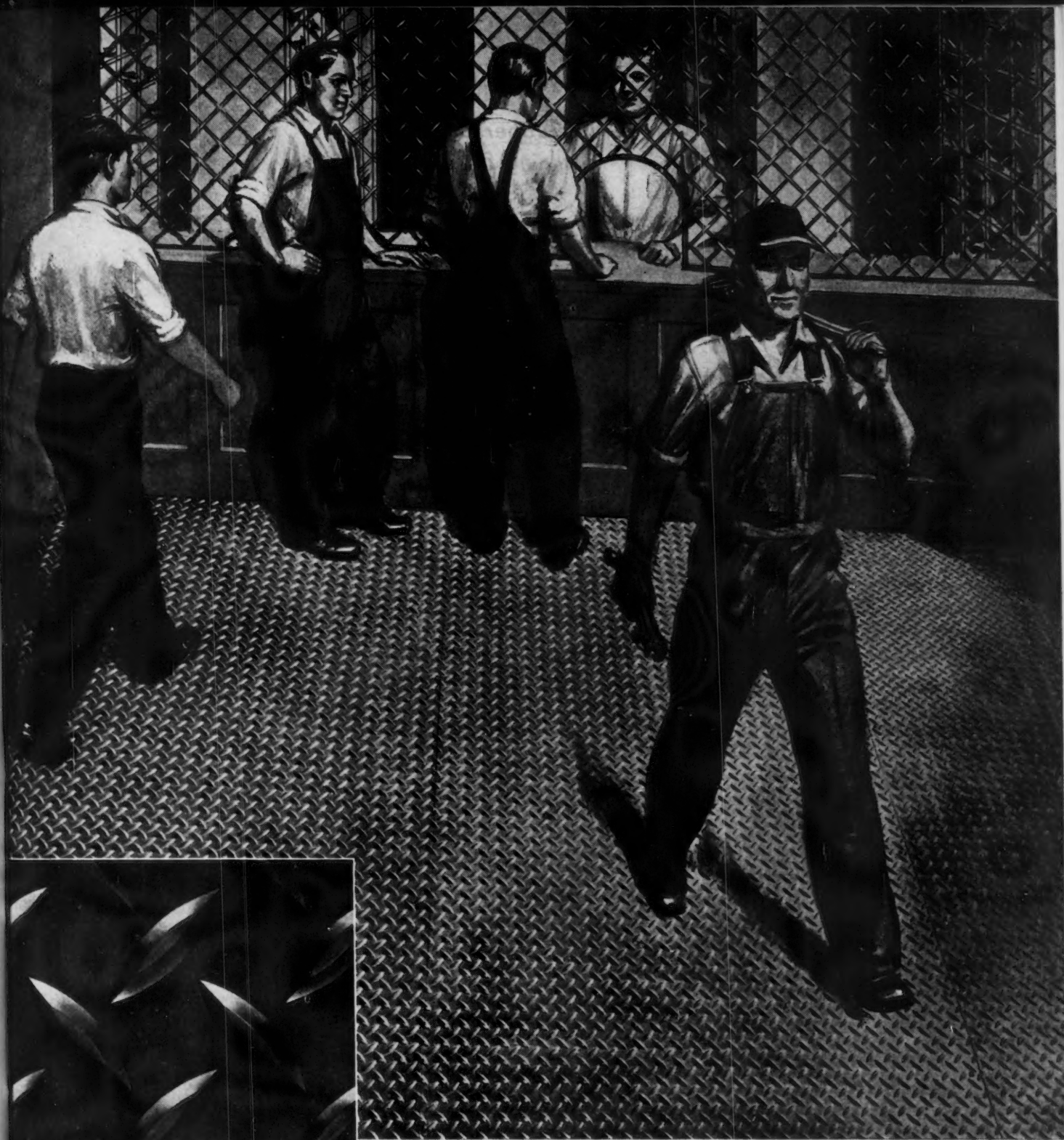
Three-point mounting with boom load centered on the driven wheels gives maximum maneuverability, stability and traction—can swing 90° to either side to pick up or deposit load. Heavy duty industrial gasoline engine, 4 travel speeds, automotive type controls; punctureproof cushion rubber or dual pneumatic tires. Ample traction to move loaded trailers, spot railroad cars. Operator always has clear view of boom and roadway.

Built by world's largest manufacturer of standard hoists; sold, serviced by over 100 leading equipment houses. Ask for Specification CL-44.

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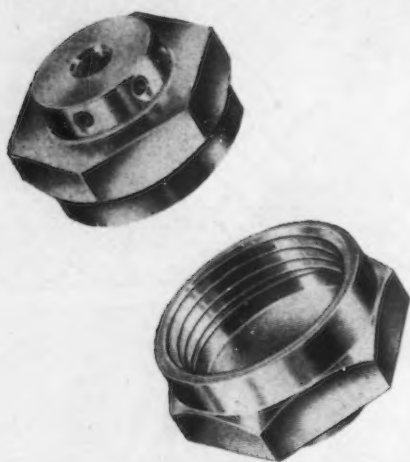


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Other products include Plates, Sheets, Billets, Blooms, Slabs—Carbon, Copper or Alloy analyses.

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You can't rush precision. Meeting close tolerances calls for all the unhurried care it is possible to give. But vast equipment and expert engineering can bring speed to precision at no sacrifice of painstaking care.

Take this Aluminum Cap Nut, a Corbin precision aircraft part. We actually put *more* work into it than was absolutely necessary — extra hand-detailing and finish better than specifications called for...

Here at Corbin you'll get better results — faster. With thousands of modern machines and a mastery of precision gained through long prewar experience, we are fully equipped to meet your exacting specifications swiftly and economically.

PJ

Some of our facilities may be available now. Send us your blueprints and specifications for prompt, helpful study of your precision requirements.

THE CORBIN SCREW CORPORATION
The American Hardware Corporation, Successor
NEW BRITAIN, CONNECTICUT



Hewitt Rubber Corp. Planning Expansion As Soon As Possible

Buffalo

... The Hewitt Rubber Corp.'s board has reviewed various plans for further expanding the company's manufacturing facilities as soon as needed machinery is available "at a cost of several hundred thousand dollars," according to President Thomas Robins, Jr.

It is hoped, he said, that these increased production facilities will enable the company to maintain employment above pre-war levels.

He explained that, while earnings in 1943 were equal to \$3.64 a share and would approximate \$3 a share this year, the company had conserved cash assets by paying only \$1 a share in the last three years.

"This has resulted in substantially increasing working capital and has made possible the expansion program now planned," Mr. Robins said, "in spite of the fact that the company in recent years also has wholly self-financed nearly \$1,000,000 worth of new buildings and machinery used in increasing its output of war products, but also believed usable in its post-war program."

"Although the company already has experienced a considerable number of war contract terminations and cutbacks, they have been, for the most part, relatively small in value and certain of the larger cutbacks have been replaced by new orders for goods of other types. Operations currently are continuing at about the same rate as throughout the year."

Predicts Bright Future For Steam Locomotives

Atlanta

... The steam locomotive, streamlined and perfected to meet postwar requirements, is here to stay. Ralph P. Johnson, chief engineer of the Baldwin Locomotive Works, expressed that opinion in discussing "Postwar Locomotives" before the Southern and Southwestern Railway Club.

"Those who point with scorn to steam locomotives as being obsolete and backward need only to observe the tremendous advances in steam power since Pearl Harbor to be convinced of the future for steam locomotives," Johnson pointed out.

"The diesel locomotive seems at the moment to be tied up to electric



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Corbin and Corbin-Phillips Screws are tough, sharp, correct from head to point — every one of them. They'll drive in straight and true under any speed, with no time-wasters.

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Insert: 180° Roll-over with right angle discharge for handling castings.

Main Picture: A Logan conveyor system for handling castings for machine operations. Equipment was designed to take care of every operation with maximum ease and speed.

—a first consideration in post-war Production Planning



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Industry has many materials and product handling problems that only adequate conveyor equipment can solve. Logan can be of special service to you in engineering conveyors to speed up production, save man hours, and increase efficiency. If you are not now using a conveyor system for moving materials, parts or products through processing, assembly, shipping and storage — or if your equipment is outmoded or inadequate — Logan can help. Send for descriptive literature — there is no obligation. Write —

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Logan Conveyors

Thousands of War-Trained Workers for Postwar Metal Industries

In *Alabama*



THIS is Tom Abbott. Two years ago he left his farm and went to work in one of Alabama's large war plants. He applied his keen intelligence to mastering his job. He learned close tolerance machine work with amazing speed. Today he rates as a highly skilled mechanic, with an outstanding production record. He wants to keep on being a mechanic when the war is over because he likes his job.

Tom Abbott is one of 110,000 workers who have learned industrial skills in Alabama war plants and essential civilian industries since Pearl Harbor. These new workers have been trained in—

Small precision castings; medium and large castings requiring intricate core work; alloy castings—grey iron and steel; centrifugal cast steel; precision sheet metal fabrication; deep drawing; precision stamping; close tolerance machine work and grinding instrument assembly; medium and heavy fabrication; radio and radar assembly, and many other trades.

These war-trained workers are only a small part of the huge labor army that will be ready to serve the postwar needs of industry in the State of Alabama.

Alabama invites your investigation of its raw materials and many favorable manufacturing advantages for metal working industries.

Specific confidential studies will be made on request. Write Dept. 1, Alabama State Chamber of Commerce, Montgomery 1, Ala.

ALABAMA
STATE PLANNING BOARD
Montgomery 5, Alabama

NEWS OF INDUSTRY

propulsion and this means that designing ingenuity will be confined to the diesel engine itself. The diesel will acquire an added appeal if future engines can be designed to burn lower grades of oil. Work is being done along these lines and the postwar diesel design will not be static."

National Gypsum Co. Increasing Postwar Reserves for Plants

Buffalo

••• The National Gypsum Co. has increased its reserve for postwar improvements and expansion from \$4,000,000 to \$7,000,000, according to President Melvin H. Baker. He told the Purchasing Agents Association of Buffalo that the company's program will involve about \$3,000,000 for plant improvements and approximately \$4,000,000 for new plants.

He listed 3,000,000 marriages and 4,000,000 births since Pearl Harbor, greatly increased savings deposits, the wartime suspension of automobile and other manufactures and the fact that "6,000,000 homes are falling apart," as factors that will tend to make for good business and relatively high employment in the postwar period.

"We do not expect any substantial increase in prices," he declared. "Some commodities that have been especially critical will come down and others will advance. In my own business, prices have not advanced for ten years and there will be no increase after the war, except for temporary advances resulting from high costs in transportation on the Atlantic seaboard until ships are plentiful."

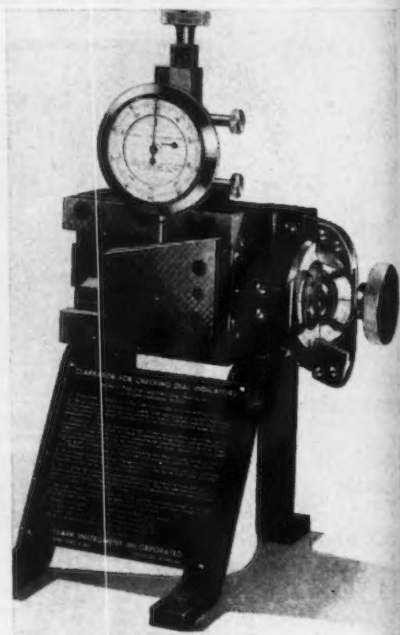
No Electronic Equipment To Be Built Under Spot Plan

Washington

••• Electronic equipment as defined in WPB L-265 is not subject to the spot authorization plan, WPB has announced. An amendment to the order has been adopted and is designed to remove any ambiguity from Direction 2 to Priorities Regulation 25, which is also being amended.

The amendment provides that no producer shall manufacture any electronic equipment except to fill preferred orders or to fulfill under the CMP, any authorized production schedule or authorized program as defined in CMP Regulation 1, except a schedule or program authorized under Priorities Regulation 25 covering the spot authorization plan.

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MICROMETER speed with sine bar precision—the fastest, most accurate method ever developed for checking dial indicators! Clarkator gives 100% inspection on every vital point. Checks comparators, hardness testers and all other instruments requiring precision dial indicating.

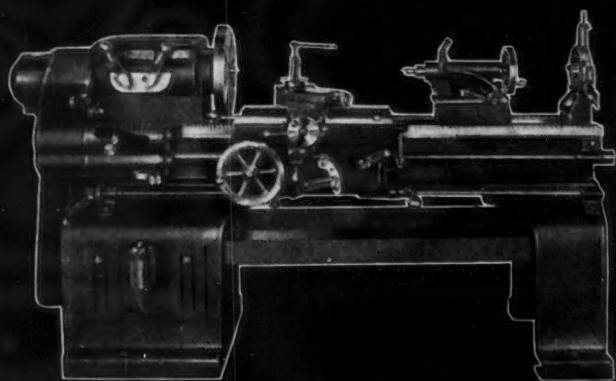
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MANUFACTURED SINCE
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Broaching vs. Milling

(CONTINUED FROM PAGE 69)

surface the chip load is only 0.003 in. per tooth to start the cut and gradually is reduced to 0.0015 in. for the last broach inserts.

On the right hand side table are also mounted two fixtures. In sequence of cuts, the first fixture holds the component while operation known as "Operation 13B, finish broach sides of magazine sides" is done, as illustrated in Fig. 7. The component is located and clamped in exactly the same way as in the roughing operation. The maximum stock to be removed is 0.030 in. on each side with roughing teeth removing 0.002 in. per tooth at the beginning and gradually decreasing to 0.0005 in. chip load per tooth for the finishing broach inserts. The second fixture holds the component while the last surface broaching operation, known as "Operation 13C, finish broach ends of magazine legs" is performed, as shown in Fig. 8. The fixture is a receiving type locating the component on both sides of magazine legs and the 10 deg.

undercut as shown at L. The component is supported on the rear end of legs, as indicated by arrow "support" and held with a clamp applied at points marked H. The maximum amount of stock to be removed is 0.101 in. However, since the cuts are narrow and relatively short the chip load on the roughing teeth is 0.007 in. per tooth, gradually decreasing to 0.001 in. for the finishing teeth. This distribution of metal removal permits use of shorter broach inserts and hence less cost for tooling.

Although two operations are performed with each stroke of the rams only one component is finished with each stroke of the right hand ram, as it is necessary to handle each component eight times in order to load and unload four fixtures, and the result is that the net output is reduced to 80 pieces per hour.

Although in the foregoing it was stated that production of the complete Garand rifle exceeded 100,000 per month, some components have been produced in much greater quantities which included initial spare parts, battle losses, and first and second

year of maintenance. However, the economic comparison of broaching vs. milling will be based on production of 1000 pieces per 8 hr., as this was the original figure adopted in 1935 for preliminary study. In Table I, giving comparative broaching and milling data for the receiver, and in tables for other components which will follow, the broaching data are based on actual production data, while the milling production data is based on experience during 1937, 1938, and 1939 when parts for the semi-automatic rifle were produced by conventional methods prevailing for the last half century in manufacturing small arms.

Perusing this table reveals that only five broaching machines and five operators are required to produce 1000 pieces per 8 hr., whereas if the milling methods were retained, then 41 milling machines and 18 operators would be necessary to produce the same quantity in 8 hr. Since Springfield Armory operates on three 8-hr. shifts more than three times as many operators would be required, namely 54 for milling as against 15 for broaching.

[In the second part of the article, to appear next week, Mr. Swidlo will describe the broaching operations on the operating rod handle and the trigger housing.]

Regional WLB Acts To Settle 6 Cases

Minneapolis

• • • The Sixth Regional War Labor Board has approved an agreement on wages and vacations, providing pay increases for various job classifications, in a case affecting seven Minneapolis foundries and the Twin Cities and Vicinity Conference Board of the International Molders and Foundry Workers Union of North America, local 176, AFL.

The firms involved are Kausel Foundry Co., Prospect Foundry Co., National Foundry Co., Scott-Atwater Foundry Co., Paul-Pufahl & Son Foundry Co., North Star Foundry Co., Acme Foundry Co., and Marrin Foundry Co., Inc. Approximately 400 workers are affected.

Wage adjustments made possible by the newly established stabilized rates set by the War Labor Board for foundry workers in Minneapolis and St. Paul, Minn., have been approved by the Regional WLB in a decision affecting Midway Iron Works, Pier



No. 1 Draw Cut Hack Saw
Dry cut, 4" x 4" capacity. A sturdy saw well-known for its dependability, economy, and invaluable service in the small shop or shop department. Simple and efficient with low original, maintenance, and blade cost.

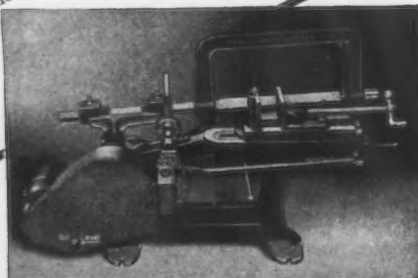
MARVELSAWS

No. 2 Draw Cut Hack Saw. Companion to the No. 1 but with a normal 6" x 6" capacity which can be increased to 8" x 8" by shortening the stroke with adjustable crank. The No. 2 MARVEL also has a swivel vise which is removable from the "T" slotted bed, permitting special fixtures to be mounted. Both machines are available in belt and motor driven models. Motor driven models can also be furnished mounted on portable truck.

Complete Range of Metal Sawing Machines

Being the largest exclusive manufacturer of metal sawing machines and blades, both hack saw and band saw type, we have the correct answer to your cut-off problems. Each MARVEL model has a distinct application, so write us and we will send our catalog, price, and recommendation for the saw to fill your requirements most efficiently. MARVEL sawing engineers are also available to discuss and analyze your cut-off work. (Without obligation of course.)

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—will put your imagination to work on
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Simplified ARC WELDING

Now is the time to plan to use welding on your future production—to take advantage of experiences gained—to cut costs and yet build a better, stronger product. "Practical Design for Arc Welding" can help you plan. Ask for this service today.

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One of the World's Largest Builders of Arc Welders.

NEWS OF INDUSTRY

Foundry Co., Universal Iron Foundry, Washington Foundry Co., and Valley Iron Works, Inc., all of St. Paul, and the Twin City and Vicinity Conference Board of International Molders and Foundry Workers Union of North America, local 232, AFL. The decision affects 129 workers. A vacation plan also has been approved.

An incentive plan affecting 203 workers of the Joliet, Ill., coke works of Carnegie-Illinois Steel Corp. and the United Steel Workers of America, CIO, has been approved by the board, effective retroactive to July 2, 1944.

Charges by the United Steel Workers of America, local 2069, CIO, that women are being hired by the Union Drawn Division of Republic Steel Corp. in Chicago at rates below the minimum provided in the contract have been ordered to arbitration by the board, which referred to provisions of the collective bargaining contract now in force. Approximately 250 workers are affected. Industry members of the board dissented from the decision.

Twenty issues in dispute, in Beloit, Wis., most of them over adjustments in wage rates for certain job classifications, have been decided by the WLB in a case involving Fairbanks, Morse & Co. and United Steelworkers of America, local 1533, CIO. Approximately 6000 workers are affected, according to the board.

The board also approved agreement by the company and union on a rate of 88c. an hour for boiler repairmen, retroactive to Oct. 18, 1943, and a helpers rate of 76c. an hour retroactive to July 18, 1943. The Board pitched three strikes in denying the union's claim for time lost by core-makers, a request for pay for time lost in the welding department and a request for adjustment in piece work in the magneto department.

Cited for Awards

• • • The following companies have received the Army-Navy "E" for outstanding war production:

Ames Baldwin Wyoming Co., No. 1 Plant, Parkersburg, W. Va.
Baldwin Locomotive Works, Standard Steel Works Division, Burnham, Pa. (fifth star)
Buffalo Forge Co., Buffalo, N. Y. (third star)
Westinghouse Electric & Mfg. Co., Sharon Works, Sharon, Pa. (fourth star)
Aluminum Industries, Inc., Cincinnati. (third star)
Calumet & Hecla Consolidated Copper Co., Calumet, Mich.
Clearing Machine Corp., Chicago.
Fulton Foundry & Machine Co., Cleveland.
Harrisburg Steel Corp., Plants 1 and 2, Harrisburg, Pa.
National Tube Co., Lorain Works, Lorain, Ohio.

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Cleaning of DIE CASTINGS

Producers and users of die castings know the high importance of CORRECT surface preparation before applying finishes either for corrosion prevention or appearance.

Since die castings may be of aluminum, zinc, magnesium, brass, bronze, copper, tin or lead, the RIGHT cleaning or degreasing material should be selected for EACH metal to thoroughly remove buffing compounds, oil, grease and shop soil. Because in EACH case, the RIGHT material assures better results, faster, more effective cleaning and LOW unit cost.

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Producers and users of die castings are invited to take advantage of the wide range of specialized Oakite materials designed for cleaning die castings, and of our 35 years' successful experience in this work. A new Special Service Report on this important subject describes cost-cutting methods used by many plants. Write for your FREE copy today.

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MACHINE TOOLS

... News and Market Activities

Tool Men See Entrance Of Speculators through Sales at Auction

Cleveland

• • • Michigan's Senator Vandenberg voiced the feelings of the machine tool industry here toward the new Surplus Property Board appointees with the comment, "We are dealing with surplus property and not surplus politicians."

Ever since the appointments were made public, and even before, it has been felt that the biggest merchandising job in history would require men of extensive business experience since, obviously, disposition of 100

billion dollars of surplus war property will be a vital factor in our postwar economy.

Some machine tool men here vaguely remembered the House Military Affairs Committee investigation of war contracts, and the \$4,000,000 in government-guaranteed loans given the Narragansett Machine Co., of Pawtucket, R. I., of which Robert A. Hurley, one of the appointees to the new board, was vice-president, and although seldom at the plant, was paid a salary of \$12,000 a year.

Furthermore, Mr. Hurley became

vice-president just before a \$2,000,000 loan was made to the company and immediately following the award of several million dollars in war contracts to Narragansett Machine. And Lt. Col. Heller, another appointee to the Surplus Board, was at that time attached to the office in charge of loans and contracts in that area.

Meanwhile, the industry here, thinking about the estimated 800,000 machine tool surplus, resigned itself to Senate approval of the board nominations. F. E. Brickel, local chief of RFC's Surplus War Property Division said that special purpose machine tools, which are classed as surplus, will be sold here at auctions and by sealed bids. (Which would seem to bring the speculators into the picture, the very thing the SWP-Board has been set up to avoid.)

According to Mr. Brickel, sales of standard machine tools are steadily increasing and indicate that the bigger the company, the more definite are their postwar plans and commitments.

Lessees, who are doing most of the buying, are free to buy at any time, and since all standard machine tools are sold on the Clayton Formula, they have priority.

Summarizing a policy which will be followed locally, at least, Mr. Brickel said, "When we set a price on a machine tool, we invite the customer's inspection, since we are interested in getting the fair price for the material as represented by its condition."

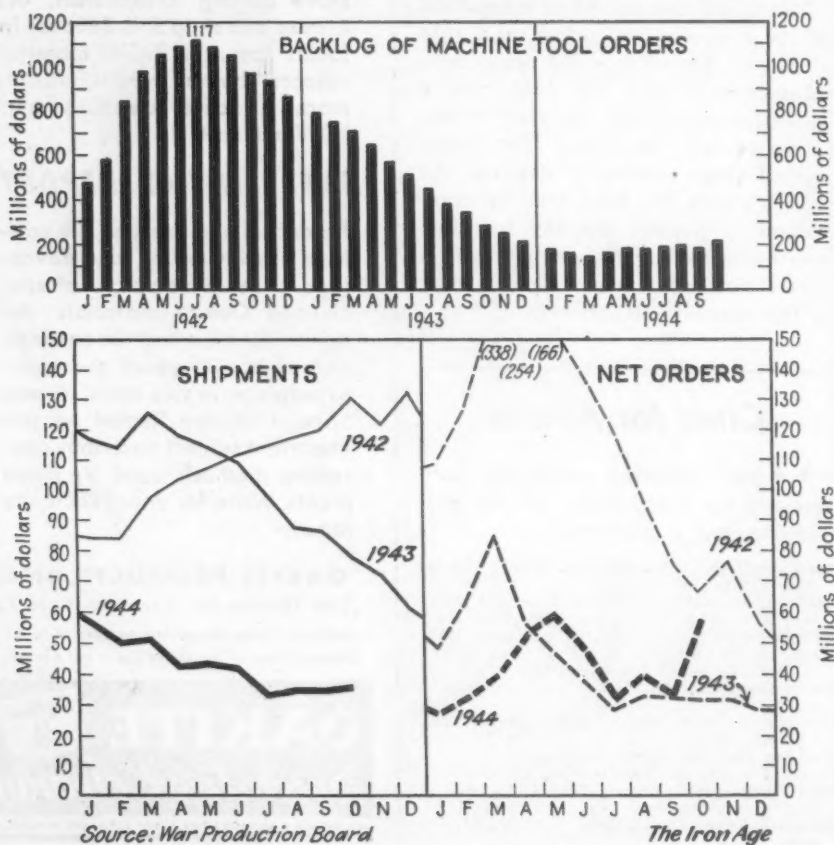
With all but a small part of the eventual surplus still harnessed to war production, business men in the area are being approached to determine what they will need to put their plants in first class condition. However, smaller war plants, with the present reconversion moratorium and a somewhat uncertain future before them, are not pouring ready cash assets into machine tools at the moment.

"Certainly one of our biggest problems," said Mr. Brickel, "will be the conversion and adaptation of special purpose machine tools to civilian production, some of which may have to be considered expendable."

Labor is still the big local problem, and the industry has been unable to effect a reversal of the trend in the falling off of employees, although there are signs that it is slowing down generally.

• Representing an increase of 3.4 per cent or \$1,224,000, October machine tool shipments by 199 firms were valued at \$37,133,000, compared with \$35,889,000 in September, according to the WPB Tools Division. Net new firm orders (total orders less cancellations) received by the firms totaled \$56,521,000—an increase of \$23,369,000, or 70.5 per cent, over September's figures. The backlog of unfilled orders increased to \$213,392,000 in October, or 9.9 per cent over September. About \$25,716,400 of this backlog is represented by unrated orders. At the present rate of shipments, approximately six months will be required to fill orders on hand as of the end of October, WPB said.

There has been a marked increase in shipments of unrated machine tool orders recently. Unrated shipments in October were valued at \$421,000 compared with a total of \$24,100 in September, the Tools Division reported.



In a Rush for Gages?



**WE'LL MEET THE
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CADILLAC *Thread* **G A G E S**

IF you're in a fix because, in the wartime rush of trying to do several things at once, you overlooked ordering Thread Plug or Thread Ring Gages for a particular checking operation, read on and you'll see that your worries are over!

From the large stock-pile that we have built up to meet emergency needs, we can ship you practically any standard size of Thread Plug or Ring Gage as soon as you give us the word.

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And remember, along with speedy delivery you also get the ultimate in quality and painstaking workmanship. Used by leading manufacturers for inspection work requiring the highest degree of accuracy, Cadillac Gages are acknowledged as being unsurpassed for the precision gaging of external and internal threads.

**WIRE YOUR ORDER
Today!**

**ALL STANDARD
SIZES**

NATIONAL FINE
NATIONAL COARSE
0-80 to 1½-6

ALSO
PIPE PLUG GAGES
⅛ to 1¼



CADILLAC GAGE COMPANY, Detroit 5

NON-FERROUS METALS

... News and Market Activities

Foreign and Domestic Lead Faces Possible Allocation by Board

••• WPB has under consideration the allocation of foreign lead and a portion of the domestic production of lead to be used in the recently expanded munitions program. It is believed in the industry that the portion of domestic production subject to allocation will amount to 20 per cent. This plus all foreign lead is expected to be required to supply the small arms ammunition program, the lead-acid battery requirements for submarines and other combat equipment, lead-base paints, cable sheathing, etc.

Throughout the war the position of lead has been enviable, for its supply and demand has been fairly well in balance, with relatively small foreign imports and some premium production from certain domestic mining areas. Recently, however, government stocks were being steadily reduced and the drastic increase in the munitions program is believed to be suf-

ficient to return it to allocation. At least the Tin, Lead and Zinc Div. has announced that it is subject to discussion by officials.

Set Aluminum Toll Maxima

Washington

••• Effective Dec. 7, OPA has announced that references of WPB's requirements governing the use of aluminum scrap by consumers have been removed from the regulation controlling prices of the commodity and a maximum of 3½c. a pound has been established for the service of converting plant aluminum scrap solids into ingots on a toll basis. This action was taken through an amendment to the aluminum scrap and secondary aluminum ingot regulation. OPA said the termination of WPB limitations on the use of aluminum scrap because of present supply conditions had ended the necessity of obtaining that

agency's approval for use of the material.

The maximum price of 3½c. a pound for converting aluminum scrap solids into ingots was adopted, OPA explained, for the purpose of bringing the charge for this service into line with other toll and conversion charges under the aluminum scrap and secondary aluminum ingot regulation.

The amendment also established the "premiums" formerly provided for baling and briquetting as the maximum prices when such services are performed on a toll basis. These charges are ½c. a pound for baling, and 1c. a pound for briquetting. Adopting the same maximum rates for toll charges as those formerly allowed as "premiums" for baling and briquetting will make it clear how the industry is to determine the proper maximum prices for such services.

A maximum price of 9½c. a pound for clean aluminum foil scrap sold for remelting is also established by the amendment. This is the same price already established for the most comparable material covered by the regulation. The price now in effect for clean aluminum foil scrap, suitable for use without remelting, is 16c. a pound.

Foreign Buyers Pay Freight

Washington

••• OPA has announced that when sales of copper are made from reserve stockpiles by government agencies to foreign buyers, these foreign buyers may absorb the cost of freight from the stockpile to the port of exit. Government agencies, OPA said, have accumulated stocks of copper to insure an adequate supply of this product for war needs. This accumulation has been an expense to the government, since it has had to absorb the freight or other costs involved in maintaining a stockpile.

••• Rapidly growing surplus stocks of copper are expected by the industry to provide for requirements of the recently expanded munitions program without any immediate modification of present WPB regulations as to uses of copper. This includes recent relaxations to provide for certain specified civilian applications which require relatively small tonnage.

V-2 CLOSE-UP: Soldiers examine wreckage of a German V-2 rocket bomb which fell in Belgium and was not completely destroyed. The engine, which is believed to be fed by a mixture of liquid air with either oxygen or alcohol, is at the left.



NON-FERROUS METALS PRICES

Primary Metals

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd. (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	\$17.00
Cadmium, del'd.	90.00
Cobalt, 97-99% (per lb.)	\$1.50 to \$1.57
Copper, electro, Conn. valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	\$35.00
Indium, 99.5%, dollars per troy oz.	\$45.00
Iridium, dollars per troy oz.	\$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	\$118 to \$120.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	\$24.00
Platinum, dollars per oz.	\$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.65

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	9.00 to 10.00
Aluminum, deoxidizing	
No. 2, 3, 4	6.00 to 9.50
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	20.37	
Copper, H.R.		17.37	
Copper drawn		18.37	
Low brass, 80%		20.40	20.15
High brass			19.48
Red brass, 85%		20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut		15.01	
Commercial bronze, 90%		21.32	21.07
Commercial bronze, 95%		21.53	21.28
Manganese bronze	24.00		28.00
Phos. bronze, A, B			
5%		36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy			
Olympic or equal		25.50	26.00
Nickel silver, 5%		28.75	26.50
Architect bronze	19.12		

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)
 Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 34c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in.,

23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

NON-FERROUS SCRAP METAL QUOTATIONS

†(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25¹
Manganese bronze solids	6.25²
Manganese bronze borings	6.50¹
Manganese bronze borings	5.50²

OPA Group 4†

Refinery brass	4.75*
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*Price varies with analysis. ¹Lead content 0.00 to 0.40 per cent. ²Lead content 0.41 to 1.00 per cent.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

Other Copper Alloys†

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

2S solids	8.00
Dural alloys, solids 14, 17, 18, 24S	3.00
25S	3.50
turnings, dry basis	2.50
Low copper alloys 51, 52, 61, 63S solids	5.50
turnings, dry basis	3.50

Plant scrap, mixed

Solids	3.00
Turnings, dry basis	2.00

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	4.50
Old castings and forgings	3.75
Pistons, free of struts	3.50
Pistons, with struts	2.00
Old alloy sheet	3.50

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt Borings and turnings	1.50
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Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

Zinc

New zinc clippings, trimmings	6.00
Engravers, lithographers plates	6.00
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.90

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ¼%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25½
Electrolytic, full size	22½
cut to size	30½
Rolled, oval, straight, 15 in. and longer	23½
Curved	24½
Brass Cast, 82-20, elliptical, 15 in. and longer	23½
Zinc: Cast, 99.99, 16 in. and over	16½
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00-13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots..40.82-41.125	
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	38.00
Zinc, sulphate, 89% crystals, bbls.	6.80

Heavy Scrap Scarce, Prices Rise Again

• • • The danger of scrap prices having remained so low for an extended period of time as to impair the functioning of normal channels of scrap movement from producer to consumer is now apparent. While scrap prices reflect the fluctuations of supply and demand, warnings have been received repeatedly from the trade that recent low prices would not permit dealers to carry on their normal function of purchase, preparation, storage, and sale of scrap. Moreover, dealers would hardly be in a position to buck the trend of mill opinion as to the course of the war especially when they recall that scrap prices dropped from \$30 to \$8 or \$9 within a short time at the end of World War I.

With the need for increased production of munitions, the fears of the trade have been realized, for heavy melting grades are scarce as indicated by the rapid increase of these prices toward ceilings. It appears that the change in the progress of the war will soon require mills to employ larger quantities of the lighter grades of scrap in their melts, and should force increased use of alloy turnings. It is reported that WPB allocations of scrap to mills are becoming more frequent. Allocations are at ceiling prices, a factor that tends to make dealers hold back on shipments at current market prices. Dealers feel that if WPB allocates scrap it will be shipped without any question because top prices will be obtained.

The most significant price change this week has been the increase in the price of turnings in many districts. As prices of the better grades of scrap are increased mills naturally turn their attention to the lighter grades. Scrap prices have increased this week in practically every district in the country, in Pittsburgh, Philadelphia and New York as much as \$1.50 a ton on No. 1 heavy melting. The IRON AGE Scrap Composite Price has reached \$18.67, an increase of \$1.59 from last week's Composite Price.

PITTSBURGH—Scrap prices continued toward ceiling, with a noticeable strengthening of price in the lighter grades. Most notable, with the exception of No. 1 and

No. 2 heavy melting, was the advance in price in the turning grades. The availability of scrap is also a problem. In spite of advancing prices, the amount of scrap coming out continues to decline. This can be traced to several factors, among which are the reluctance of industrial and railroad producers to sell below ceiling and the reluctance of dealers to sell until after the turn of the year.

CHICAGO—Broker purchases to cover short interests have sent heavy industrial and railroad scrap to ceiling levels, although no mill purchases have taken place up to the time this was written. It is problematical whether mills will be interested at these levels, for no basic change can be discerned in the supply situation and inventories generally are good. The rise here may be attributed to the successful action by the railroads in withholding material from the market for better prices and to a restriction on territory on which the Chicago market can draw due to higher offering prices in the East. So far no interest has been expressed in less desirable grades such as galvanized bundles and machine shop turnings, and dealers' scrap has failed to keep pace with heavy industrial and railroad thus creating an abnormally high differential. Until this differential is narrowed and interest shown in these less attractive grades, present prices cannot be considered to have been confirmed. In the meantime they serve as a guide as to what offers are necessary to secure material.

DETROIT—Prices continued to move up here this week in the wake of definitely strong bids on several automotive lists. However, current going prices are not as high as the offers on some portions of the lists. Outside interests entered direct bids for the scrap of several producers, and in one case a mill asking for water shipment to Buffalo offered prices well above the going market. However, this is not considered a price-making factor inasmuch as local and Valley users of Detroit scrap, staying in the market, have not made offers to match. Some of the lists saw a variance in bidding between No. 1 and No. 2 heavy melting, indicating that the prices on those grades which continue identical at Detroit, may shortly show the divergence which has appeared in other markets.

PHILADELPHIA—Concurrent with the increasing strength in the scrap market throughout the East, brokers here are being forced to pay higher and higher prices to cover existing orders. The price for No. 1 heavy melting steel scrap this week has been raised to \$17.50 to \$18. All other items are also reflecting the stronger market. There have been no new mill orders to date, and brokers are apparently not too anxious for any new business yet because of the trend back to

ceiling prices in other districts. They are afraid that they may again have to pay higher than mill prices to cover any new orders made at under ceiling prices. With the elimination of the springboard, mills here may be faced with competition from other districts. In fact, there has been some scrap moving out of the district but the quantities have been fairly small.

BOSTON—Boston scrap prices are within striking distance of ceilings. No. 1 steel is now \$14 a ton, up \$1 for the week to within \$1.05 of the ceiling price. Other grades of scrap, with the exception of mixed alloy turnings for which there is no demand, are relatively higher. Many sales of low phos plate are reported at ceiling prices. At Portland about 2000 tons of No. 1 shipyard steel sold at \$14.85 a ton, the ceiling price for that shipping point. No. 1 Hingham shipyard steel is moving at \$14.06 a ton, or a little under ceiling.

NEW YORK—Heavy melting steels have increased \$1.50 again this week, which brings No. 1 to within 83c. of ceiling. Open hearth grade differentials are still maintained. Dealers take exception to the statement that offerings are not being made to mills in order to curtail profits for tax purposes. They hold that few, if any, dealers have realized profits sufficient this year to require such a procedure. The real reason for the lack of offerings reported last week, it is said, was the need for dealers to cover existing contracts before making new commitments. Turnings prices remain the same, and cast prices are still at ceilings.

CINCINNATI—Consumer buying prices in the southern Ohio district have moved upward on the better items a trifle during the past week in sympathy with the change in other areas. Activity in this district, however, has been confined largely to dealers' efforts to cover on old contracts and consumers' interests in new purchases have been lacking. For the most part, leading consumers in the area refuse to expand present inventories.

BIRMINGHAM—The scrap market in this district is showing a firmer tone although no large sales here have been reported. Prices have advanced as much as \$1 a ton on such specialties as rolls for rerolling, scrap rail, rails three feet and under, angle and splice bars and cast iron borings.

SAN FRANCISCO—Contrary to trend at other mill centers scrap continues plentiful on the west coast as shipbuilding and heavy industry continue to generate larger quantities than mill operations can absorb. Dealers, industrial producers and mills and foundries are reluctant to increase their inventories. Principal mill buyers in California during December will purchase No. 1 heavy melting at \$1.50 below ceiling, a drop of 50c. below market for the past several months. Other grades will continue to hold their pre-ceiling differentials.

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4).

PITTSBURGH

Per gross ton delivered to consumer:	
No. 1 hvy. melting...	\$19.50 to \$20.00
RR. hvy. melting...	20.25 to 20.75
No. 2 hvy. melting...	18.50 to 19.00
RR. scrap rails	21.50
Rails 3 ft. and under	23.50
No. 1 comp'd sheets	19.50 to 20.00
Hand bldd. new shts.	18.50 to 19.90
Hvy. axle turn.	18.00 to 18.50
Hvy. steel forge turn.	18.00 to 18.50
Mach. shop turn.	13.00 to 13.50
Short shov. turn.	15.00 to 15.50
Mixed bor. and turn.	13.00 to 13.50
Cast iron borings	15.00 to 15.50
Hvy. break. cast	16.50 plus frt.
No. 1 cupola	20.00 plus frt.
RR. knuck. and coup.	22.50 to 23.00
RR. coil springs	22.50 to 23.00
Rail leaf springs	22.50 to 23.00
Rolled steel wheels	22.50 to 23.00
Low phos. billet crops	24.45
Low phos.	20.50 to 21.00
RR. malleable	22.00 plus frt.

CHICAGO

Per gross ton delivered to consumer:	
No. 1 hvy. melting...	\$18.25 to 18.75
No. 2 hvy. melting...	16.25 to 16.75
No. 1 bundles	18.00 to 18.50
No. 2 dealers' bndls.	15.75 to 16.25
Galv. bundles (No. 3)	12.75 to 13.25
Mach. shop turn.	8.50 to 9.00
Short shoveling turn.	8.50 to 9.00
Cast iron borings	8.75 to 9.25
Mix. bor. & short turn.	8.75 to 9.25
Low phos. hvy. forge	21.50 to 22.00
Low phos. plates	20.25 to 20.75
No. 1 RR hvy. melting	19.25 to 19.75
Reroll rails	22.25
Cut rails, 3 ft. and under	22.25
Locomotive tires, cut	20.25 to 20.75
Cut bolsters & side frames	19.25 to 19.75
Angles & splice bars	21.75 to 22.25
No. 3 steel wheels	19.75 to 20.25
Couplers & knuckles	21.00 to 21.50
Miscellaneous rails	20.25
Agricul. malleable	20.50 to 21.00
RR. malleable	22.00
Std'dard stl. car axles	23.50 to 24.00
FOB shipping point	
No. 1 mach. cast	20.00
No. 1 agricul. cast	20.00
Cast iron car wheels	20.00
Hvy. breakable cast	16.50
RR. grate bars	15.25
Brake shoes	15.25
Stove plate	19.00
Clean auto cast	20.00

CINCINNATI

Per gross ton delivered to consumer:	
No. 1 hvy. melting...	\$17.00 to \$17.50
No. 2 hvy. melting...	16.00 to 16.50
No. 1 bundles	17.00 to 17.50
No. 2 bundles	15.00 to 15.50
Mach. shop turn	5.50 to 6.00
Shoveling turn.	7.00 to 7.50
Cast iron borings	7.50 to 8.00
Mixed bor. & turn.	6.00 to 6.50
No. 1 cupola cast	21.00
Hvy. breakable cast	16.50
Low phos. plate	20.00 to 21.00
Scrap rails	20.00 to 21.00
Stove plate	15.50 to 16.00

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting...	\$13.50 to \$14.00
No. 2 hvy. melting...	12.50 to 13.00
Busheling	12.50 to 13.00
No. 1 bundles	12.50 to 13.00
No. 2 bundles	11.50 to 12.00
Turnings, shovellings	6.75 to 7.25
Turnings, regular	5.50 to 6.00
Mixed bor. & turn.	5.50 to 6.00
Clean cast. chem. bor.	12.56 to 14.15
Delivered to fdry. per gr. ton	
Breakable cast	21.57 to 21.87
Stove plate	20.00 to 23.51
Machinery cast, truck	21.00 to 23.51

DETROIT

Per gross ton, brokers' buying prices:	
No. 1 hvy. melting...	\$13.50 to \$14.00
No. 2 hvy. melting...	13.50 to 14.00
No. 1 bundles	13.50 to 14.00
New busheling	13.50 to 14.00
Mach. shop turn.	6.00 to 7.00
Short shov. turn.	8.50 to 9.00
Cast iron borings	8.50 to 9.00
Mixed. bor. & turn.	6.00 to 7.00
No. 1 cupola cast	19.00 to 20.00
Charging box cast	14.50 to 15.50
Hvy. breakable cast	13.00 to 13.50
Stove plate	17.00 to 17.50
Flashings	13.50 to 14.00
Low phos. plate	15.50 to 16.00
Automotive cast	19.00 to 20.00

PHILADELPHIA

Per gross ton delivered to consumer:	
No. 1 hvy. melting...	\$17.50 to \$18.00
No. 2 hvy. melting...	16.50 to 17.00
No. 2 bundles	15.50 to 16.50
Mach. shop turn.	10.00 to 10.50
Shoveling turn.	12.00 to 12.50
Cast iron borings	10.00 to 10.50
Mixed bor. & turn.	10.00 to 10.50
No. 1 cupola cast	20.00
Hvy. breakable cast	16.50
Cast, charging box	19.00
Hvy. axle, forge turn.	16.50 to 17.00
Low phos. plate	20.50 to 21.00
Low phos. punchings	20.50 to 21.00
Billet crops	19.50 to 20.00
RR. steel wheels	19.50 to 20.00
RR. coil springs	19.50 to 20.00
RR. malleable	22.00
*F.o.b. shipping point.	

ST. LOUIS

Per gross ton delivered to consumer:	
Hvy. melting	\$16.25 to \$16.50
No. 1 locomotive tires	16.00 to 16.50
Misc. stand. sec. rails	17.00 to 17.50
Railroad springs	18.00 to 18.50
Bundled sheets	13.00 to 13.50
Heavy axle turn	8.00 to 8.50
Machine shop turns	6.75 to 7.25
Rerolling rails	21.00
Steel car axles	21.00 to 21.50
Steel rails under 3 ft.	21.50
Steel angle bars	17.50 to 18.00
Cast iron car wheels	20.00
No. 1 machinery cast	20.00
Railroad malleable	20.00 to 20.50
Breakable cast	16.50
Stove plate	18.00
Grate bars	15.25
Brake shoes	15.25
Note: Cast grades f.o.b. Shipping Point.	

BIRMINGHAM

Per gross ton delivered to consumer:	
No. 1 hvy. melting...	\$14.50 to \$15.00
No. 2 hvy. melting...	13.50 to 14.00
No. 2 bundles	12.50 to 13.00
No. 1 busheling	11.50 to 12.00
Scrap rails	15.00 to 15.50
Rails for rerolling	18.00 to 18.50
Rails 3 ft. & under	18.00 to 18.50
Angles & splice bars	17.50 to 18.00
Long turn.	4.50 to 5.00
Cast iron borings	7.50 to 8.00
Steel axles	14.50 to 15.00
Stove plate	16.50 to 17.00
Bar crops and plate	16.00 to 16.50
Structural and plate	16.00 to 16.50
No. 1 cast	20.00 to 21.00
Cast iron carwheels	13.00 to 13.50

YOUNGSTOWN

Per gross ton delivered to consumer:	
No. 1 hvy. melting...	\$17.00 to \$17.50
No. 2 hvy. melting...	16.50 to 17.00
Low phos. plate	19.50 to 20.00
No. 1 busheling	17.00 to 17.50
Hydraulic bundles	17.00 to 17.50
Mach. shop turn.	10.00 to 10.50
Short shov. turn.	12.50 to 13.00
Cast iron borings	11.50 to 12.00

NEW YORK

Dealers' buying prices, per gross ton, on cars:

No. 1 hvy. melting...	\$14.00 to \$14.50
No. 2 hvy. melting...	13.00 to 13.50
Hyd. comp. black bundles	12.00 to 12.50
Hyd. comp. galv. bundles	10.00 to 10.50
Hvy. breakable cast	16.50
Charging box cast	19.00
No. 1 cupola cast	20.00
Clean auto cast	20.00
Unstrip. motor blks.	17.50
Stove plate	19.00
Clean chem. cast bor.	14.33
Mach. shop turn.	5.50 to 6.00
Mixed bor. & turn.	5.50 to 6.00

BUFFALO

Per gross ton delivered to consumer:	
No. 1 hvy. melting...	\$17.75 to \$18.25
No. 1 bundles	16.50 to 16.00
No. 2 bundles	14.50 to 15.00
No. 2 hvy. melting	15.50 to 16.00
Mach. shop turn	9.00 to 9.50
Shoveling turn.	11.00 to 11.50
Cast iron borings	10.00 to 10.50
Mixed bor. & turn.	10.00 to 10.50
No. 1 cupola cast	20.30 to 22.50
Stove plate	19.80 to 21.50
Low phos. plate	21.75
Scrap rails	19.00 to 19.25
Rails 3 ft. & under	22.75
RR. steel wheels	22.75
Cast iron car wheels	20.00
RR. coil & leaf sprgs.	22.75
RR. knuckles & coup.	22.75
RR. malleable	22.00
No. 1 busheling	15.50 to 16.00

CLEVELAND

Per gross ton delivered to consumer:	
No. 1 hvy. melting...	\$16.00 to \$16.50
No. 2 hvy. melting...	16.00 to 16.50
Compressed sheet stl.	16.00 to 16.50
Drop forge flashings	15.50 to 16.00
No. 2 bundles	15.00 to 15.50
Mach. shop turn.	8.00 to 8.50
Short shovel.	11.50 to 12.00
No. 1 busheling	16.00 to 16.50
Steel axle turn.	15.00 to 15.50
Low phos. billet and bloom crops	20.50 to 21.50
Cast iron borings	11.50 to 12.00
Mixed bor. & turn.	10.50 to 11.00
No. 2 busheling	13.50 to 14.00
No. 1 machine cast	20.00 plus frt.
Railroad cast	20.00 plus frt.
Railroad grate bars	15.75
Stove plate	19.00 plus frt.
RR. hvy. melting	18.00 to 18.50
Rails 3 ft. & under	23.50 to 24.00
Rails 18 in. & under	24.75 to 25.25
Rails for rerolling	23.50 to 24.00
Railroad malleable	22.00 plus frt.
Elec. furnace punch.	18.50 to 19.00

SAN FRANCISCO

Per gross ton delivered to consumer:	
No. 1 hvy. melting...	\$15.50 to \$16.25
RR. hvy. melting	15.50 to 16.25
No. 2 hvy. melting...	14.50 to 15.25
No. 2 bales	13.50 to 14.25
No. 3 bales	9.50 to 10.50
Mach. shop turn.	6.00 to 7.00
Elec. furn 1 ft. under	15.50 to 17.00
No. 1 cupola cast	19.00 to 21.00

LOS ANGELES

Per gross ton delivered to consumer:	
No. 1 hvy. melting...	\$14.00 to \$15.00
No. 2 hvy. melting...	13.00 to 14.00
No. 2 bales	12.00 to 13.00
No. 3 bales	9.00 to 10.00
Mach. shop turn.	4.50 to 5.00
No. 1 cupola cast	19.00 to 20.00

SEATTLE

Per gross ton delivered to consumer:	
No. 1 hvy. melting...	\$13.50
RR. hvy. melting	13.50
No. 3 bundles	11.50
Elec. furn. 1 ft. und.	\$16.00 to 17.00
No. 1 cupola cast	20.00

Comparison of Prices . . .

Advances Over Past Week in Heavy Type; Declines in *Italics*.

(Prices Are F.O.B. Major Basing Points)

Flat Rolled Steel: (Cents Per Lb.)	Dec. 5, 1944	Nov. 28, 1944	Oct. 31, 1944	Dec. 7, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00

Tin and Terne Plate: (Dollars Per Base Box)	Dec. 5, 1944	Nov. 28, 1944	Oct. 31, 1944	Dec. 7, 1943
Tin plate, standard cokes	\$5.00	\$5.00	\$5.00	\$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30

Bars and Shapes: (Cents Per Lb.)	Dec. 5, 1944	Nov. 28, 1944	Oct. 31, 1944	Dec. 7, 1943
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40

Wire and Wire Products: (Cents Per Lb.)	Dec. 5, 1944	Nov. 28, 1944	Oct. 31, 1944	Dec. 7, 1943
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55

Rails: (Dollars Per Gross Ton)	Dec. 5, 1944	Nov. 28, 1944	Oct. 31, 1944	Dec. 7, 1943
Heavy rails	\$40.00	\$40.00	\$40.00	\$40.00
Light rails	40.00	40.00	40.00	40.00

Semi-Finished Steel: (Dollars Per Gross Ton)	Dec. 5, 1944	Nov. 28, 1944	Oct. 31, 1944	Dec. 7, 1943
Rerolling billets	\$34.00	\$34.00	\$34.00	\$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00

Wire Rods and Skelp: (Cents Per Lb.)	Dec. 5, 1944	Nov. 28, 1944	Oct. 31, 1944	Dec. 7, 1943
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

The various basing points for finished and semi-finished steel are listed in the detailed price table, pages 165-173.

Pig Iron: (Per Gross Ton)	Dec. 5, 1944	Nov. 28, 1944	Oct. 31, 1944	Dec. 7, 1943
No. 2 fdy., Philadelphia	\$25.84	\$25.84	\$25.84	\$25.84
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)	Dec. 5, 1944	Nov. 28, 1944	Oct. 31, 1944	Dec. 7, 1943
Heavy melt'g steel, P'gh.	\$19.75	\$18.25	\$15.75	\$20.00
Heavy melt'g steel, Phila.	17.75	15.50	15.00	18.75
Heavy melt'g steel, Ch'go	18.50	17.50	16.50	18.75
No. 1 hy. comp. sheet, Det.	13.75	12.75	11.75	17.85
Lowphos. plate, Youngs'n	19.75	19.75	17.75	22.50
No. 1 cast, Pittsburgh	20.00*	20.00*	20.00*	20.00
No. 1 cast, Philadelphia	20.00*	20.00*	20.00*	20.00
No. 1 cast, Chicago	20.00*	20.00*	20.00*	20.00

*F.o.b. shipping point.

Coke, Connellsville: (Per Net Ton at Oven)	Dec. 5, 1944	Nov. 28, 1944	Oct. 31, 1944	Dec. 7, 1943
Furnace coke, prompt	\$7.00	\$7.00	\$7.00	\$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.50

Non-Ferrous Metals: (Cents Per Lb. to Large Buyers)	Dec. 5, 1944	Nov. 28, 1944	Oct. 31, 1944	Dec. 7, 1943
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

Composite Prices . . .

FINISHED STEEL

December 5, 1944	2.30837c. a Lb.
One week ago	2.30837c. a Lb.
One month ago	2.30837c. a Lb.
One year ago	2.25513c. a Lb.

	HIGH	LOW
1944	2.30837c., Sept. 5	2.272349c., Jan. 4
1943	2.25513c.,	2.25513c.,
1942	2.26190c.,	2.26190c.,
1941	2.43078c.,	2.43078c.,
1940	2.30467c., Jan. 2	2.24107c., Apr. 16
1939	2.35367c., Jan. 3	2.26689c., May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18
1937	2.58414c., Mar. 9	2.32263c., Jan. 4
1936	2.32263c., Dec. 28	2.05200c., Mar. 10
1935	2.07642c., Oct. 1	2.06492c., Jan. 8
1934	2.15367c., Apr. 24	1.95757c., Jan. 2
1933	1.95578c., Oct. 3	1.75836c., May 2
1932	1.89196c., July 5	1.83901c., Mar. 1
1931	1.99626c., Jan. 13	1.86586c., Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

PIG IRON

23.61 a Gross Ton	23.61 a Gross Ton
23.61 a Gross Ton	23.61 a Gross Ton
23.61 a Gross Ton	23.61 a Gross Ton
23.61 a Gross Ton	23.61 a Gross Ton
23.61, Mar. 20	23.45, Jan. 2
23.45, Dec. 23	22.61, Jan. 2
22.61, Sept. 19	20.61, Sept. 12
23.25, June 21	19.61, July 6
23.25, Mar. 9	20.25, Feb. 16
19.74, Nov. 24	18.73, Aug. 11
18.84, Nov. 5	17.83, May 14
17.90, May 1	16.90, Jan. 27
16.90, Dec. 5	13.56, Jan. 3
14.81, Jan. 5	13.56, Dec. 6
15.90, Jan. 6	14.79, Dec. 15
18.21, Jan. 7	15.90, Dec. 16
18.71, May 14	18.21, Dec. 17

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

SCRAP STEEL

\$18.67 a Gross Ton	\$17.08 a Gross Ton
\$17.08 a Gross Ton	\$15.75 a Gross Ton
\$15.75 a Gross Ton	\$19.17 a Gross Ton
\$19.17 a Gross Ton	\$19.17 a Gross Ton
\$19.17, Apr. 10	\$22.00, Jan. 7
16.04, Apr. 9	21.83, Dec. 30
14.08, May 16	22.50, Oct. 3
11.00, June 7	15.00, Nov. 22
12.67, June 8	21.92, Mar. 30
12.67, June 9	17.75, Dec. 21
10.33, Apr. 29	13.42, Dec. 10
9.50, Sept. 25	13.00, Mar. 13
6.75, Jan. 3	12.25, Aug. 8
6.43, July 5	8.50, Jan. 12
8.50, Dec. 29	11.33, Jan. 6
11.25, Dec. 9	15.00, Feb. 18
14.08, Dec. 3	17.58, Jan. 29

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Prices of Finished Iron and Steel . . .

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 0.10¢ per lb. under base; primes 0.25¢ above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25¢ per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50¢. (14) This base price for annealed, bright finish wires, commercial spring wire.

Basing Point ↓ Product →	Pitts- burgh	Chicago	Gary	Cleve- land	Birm- ingham	Buffalo	Youngs- town	Spar- rows Point	Granite City	Middle- town, Ohio	Gulf Ports, Cars	Pacific Ports, Cars	DELIVERED TO		
													Detroit	New York	Phila- delphia
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold Rolled Sheets ¹	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	3.67¢
Long Ternes ²	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
Hot Rolled Strip ³	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold Rolled Strip ⁴	2.80¢	2.90¢		2.80¢			2.80¢		(Worcester = 3.00¢)				2.90¢	3.16¢	
Cooperage Stock Strip	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢		(Worcester = 3.35¢)				3.05¢	3.31¢	
Coke Tin Plate, Base Box	\$5.00	\$5.00	\$5.00						\$5.10					5.36¢	5.32¢
.25 .50 .75 Electro Tin Plate, Box	\$4.35 \$4.50 \$4.65	\$4.35 \$4.50 \$4.65	\$4.35 \$4.50 \$4.65						\$4.60 \$4.75						
Black Plate (29 gage) ⁵	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ ¹³			3.37¢
Mfg. Ternes, Special Box	\$4.30	\$4.30	\$4.30						\$4.40						
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			(Duluth = 2.25¢)	2.50¢	2.80¢	2.25¢	2.49¢	2.47¢	
Rail Steel Bars ⁶	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (Billet) Bars ⁷	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢ ¹³	2.25¢	2.39¢	
Reinforcing (Rail) Bars ⁷	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢ ¹³	2.25¢		2.47¢
Cold Finished Bars ⁸	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)	(Toledo = 2.80¢)			2.99¢	2.97¢	
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢			(Bethlehem, Massillon, Canton = 2.70¢)				2.80¢		
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢		(Coatesville and Claymont = 2.10¢)	2.10¢	2.35¢	2.45¢	2.32¢	2.29¢	2.15¢
Floor Plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	3.67¢
Alloy Plates	3.50¢	3.50¢							(Coatesville = 3.50¢)		3.95¢	4.15¢		3.70¢	3.59¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢			(Bethlehem = 2.10¢)	2.45¢	2.75¢		2.27¢	2.215¢	
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢					(Worcester = 3.00¢)						
0.51 to 0.75 Carbon	4.30¢			4.30¢					(Worcester = 4.50¢)						
0.76 to 1.00 Carbon	6.15¢			6.15¢					(Worcester = 6.35¢)						
1.01 to 1.25 Carbon	8.35¢			8.35¢					(Worcester = 8.55¢)						
Bright Wire ¹⁴	2.60¢	2.60¢		2.60¢	2.60¢				(Worcester = 2.70¢)	(Duluth = 2.65¢)	3.10¢			2.92¢	
Galvanized Wire															
Spring (High Carbon)	3.20¢	3.20¢		3.20¢					(Worcester = 3.30¢)			3.70¢			3.52¢
Steel Sheet Piling	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6
 Slabs—Andrews Steel Co. \$41 basing pts.;
 Wheeling Steel Corp. (rerolling) 4 in. sq. or larger \$37.75 f.o.b. Portsmouth, Ohio;
 Empire Sheet & Tin Plate Corp. \$41;
 Phoenix Iron Co. (rerolling) \$41, (forging) \$47; Granite City Steel \$47.50.
 Blooms—Phoenix Iron Co. (rerolling) \$41, (forging) \$47; Pgh. Steel Co. (reroll) \$38.25, (forging) \$44.25. Wheeling Steel Corp. (rerolling) 4 in. sq. or larger \$37.75 f.o.b. Portsmouth.
 Sheet bar—Empire Sheet & Tin Plate Co. \$39 mill; Wheeling Steel Corp. \$38 Portsmouth, Ohio.
 Billets, Forging—Andrews Steel Co. \$50 basing pts.; Follansbee Steel Corp. \$49.50 Toronto; Phoenix Iron Co. \$47.00 mill. Geneva Steel Co. \$64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. \$49.50.
 Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area \$34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) \$41 mill; Wheeling Steel Corp. 4 in. sq. or larger \$37.75, smaller \$39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at \$39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. \$41 mill; Continental Steel Corp. (1½ x 1½) \$39.50, (2 x 2) \$40.60 Kokomo, Ind. (these prices include \$1 size extra); Keystone Steel & Wire Co. \$36.40 Peoria; Connors Steel Co. \$50.60 Birmingham; Ford Motor Co. \$34 Dearborn, Mich. Geneva Steel Co. \$58.64 f.o.b. Pac. C. Pgt. Steel Co. \$43.50.

Structural Shapes—Phoenix Iron Co. \$2.35 basing pts. (export) \$2.50 Phoenixville; Knoxville Iron Co. \$2.30 basing points.
 Rails—Sweet Steel Co. (rail steel) \$50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., \$45 Pueblo.
 Hot Rolled Plate—Granite City Steel Co. \$2.65 mill; Knoxville Iron Co. \$2.25 basing pts.; Kaiser Co. and Geneva Steel Co. \$3.20 Pacific Ports; Central Iron and Steel Co. \$2.50 basing points; Granite City Steel Co. \$2.35 Granite City.
 Merchant Bars—W. Ames & Co., 10 tons and over, \$2.85 mill; Eckels-Nye Steel Corp., \$2.50 basing pts. (rail steel) \$2.40; Phoenix Iron Co. \$2.40 basing pts.; Sweet Steel Co. (rail steel) \$2.35 mill; Joslyn Mfg. & Supply Co., \$2.35 Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar) \$2.35 Chicago; Knoxville Iron Co. \$2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill. Milton Mfg. Co. \$2.75 f.o.b. Milton, Pa.
 Pipe Skelp—Wheeling Steel Corp., Benwood, \$2.05 per cwt.
 Reinforcing Bars—W. Ames & Co., 10 tons and over, \$2.85 mill; Sweet Steel Co. (rail steel) \$2.35 mill; Columbia Steel Co. \$2.50 Pacific Ports.
 Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Mansfield, Mass.,

f.o.b. Mansfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass. f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.
 Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago, base, f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.
 Hot Rolled Strip—Joslyn Mfg. & Supply Co. \$2.30 Chicago; Knoxville Iron Co. \$2.25 basing pts.
 Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., \$2.25 Parkersburg.
 Galvanized Sheets—Andrews Steel Co. \$3.75 basing pts.; Parkersburg Iron & Steel Co. \$3.85 Parkersburg; Apollo Steel Co. \$3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.
 Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.
 Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is \$2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

PRICES

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to O.P.A. Price Schedule 49.

Cities	SHEETS			STRIP		Plates 1/4 in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 9442-48 Ann.	Cold Drawn, NE 9442-48 Ann.	Cold Drawn, NE 9442-48 Ann.	Cold Drawn, NE 9442-48 Ann.
Philadelphia	3.518	4.872*	5.018*	3.922	4.772	3.605	3.666	3.822	4.072	6.968	7.068	7.272	8.322
New York	3.590	4.813*	5.010	3.974*	4.772	3.768	3.758	3.853	4.103	6.908	7.108	7.303	8.353
Boston	3.744	4.744*	5.224*	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.282	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.082	.....	.....	.....	.....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.185	.....	.....	.....	.....
Chicago	3.25	4.20	5.231	3.60	4.651*	3.55	3.55	3.50	3.75	6.75	6.85	6.85	7.90
Milwaukee	3.387	4.337*	5.272*	3.737	4.7871*	3.687	3.687	3.637	3.887	6.987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.874*	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.754*	3.619	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.004*	3.70	4.6591*	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475*	4.825*	3.675	4.711	3.611	3.691	3.611	4.011	.....	.....	.....	.....
St. Louis	3.397	4.347*	5.172*	3.747	4.9311*	3.697	3.697	3.847	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.48	5.257*	3.86	4.351*	3.811*	3.811*	3.781*	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608*	4.215	.....	4.165	4.165	4.115	4.43	.....	.....	.....	.....
Indianapolis	3.58	3.58	4.588	4.918	3.768	4.78	3.63	3.58	3.96	6.08	7.18	7.18	8.23
Birmingham	3.45	4.75	4.75	3.70	.....	3.55	3.55	3.50	4.43	.....	.....	.....	.....
Memphis	3.965*	4.66	3.265	4.215	.....	4.065	4.065	4.015	4.33	.....	.....	.....	.....
New Orleans	4.058*	4.95	5.358	4.308	.....	4.158	4.158*	4.108*	4.629	.....	.....	.....	.....
Houston	3.763	5.573	6.3131	4.313	.....	4.25	4.25	3.75	6.373	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20*	6.104	4.95	5.8131*	4.95	4.65	4.40	5.583	6.304	9.404	9.404	10.454
San Francisco	4.5514	7.304	6.354	4.5014	7.3331*	4.6514	4.3514	4.1514	5.333	6.304	9.404	9.404	10.454
Seattle	4.6512	7.054	5.954	4.2512	.....	4.7512	4.4512	4.3512	5.783	.....	9.404	.....	.....
Portland	4.6511	6.604	5.754	4.7511	.....	4.7511	4.4511	4.4511	5.533	6.304	9.404	8.304	9.404
Salt Lake City	4.5317	.....	6.171*	5.5317	.....	4.9817	4.9817	4.8817	5.90	.....	.....	.....	.....

MILL EXTRAS FOR NATIONAL EMERGENCY STEELS

Designa- tion	Basic Open-Hearth		Electric Furnace		Designa- tion	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 1330	0.10¢	\$2.00	.....	.....	NE 9415	0.75¢	\$15.00	\$1.25	\$25.00
NE 1335	0.10	2.00	.....	.....	NE 9417	0.75	15.00	1.25	25.00
NE 1340	0.10	2.00	.....	.....	NE 9420	0.75	15.00	1.25	25.00
NE 1345	0.10	2.00	.....	.....	NE 9422	0.75	15.00	1.25	25.00
NE 1350	0.10	2.00	.....	.....	NE 9425	0.75	15.00	1.25	25.00
NE 8812	0.65¢	\$13.00	\$1.15	\$23.00	NE 9427	0.75	15.00	1.25	25.00
NE 8815	0.65	13.00	1.15	23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8817	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8820	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8822	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8825	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8827	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8830	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8832	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8835	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8837	0.65	13.00	1.15	23.00	NE 9722	0.65¢	\$13.00	\$1.15	\$23.00
NE 8840	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8842	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8845	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
NE 8847	0.65	13.00	1.15	23.00	NE 9742	0.65	13.00	1.15	23.00
NE 8850	0.65	13.00	1.15	23.00	NE 9745	0.65	13.00	1.15	23.00
NE 8712	0.70¢	\$14.00	\$1.20	\$24.00	NE 9747	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9753	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00	NE 9755	0.65	13.00	1.15	23.00
NE 8722	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8725	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8727	0.70	14.00	1.20	24.00	NE 9830	\$1.30	\$26.00	\$1.80	\$36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9835	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8747	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8750	0.70	14.00	1.20	24.00	NE 9912	\$1.20	\$24.00	\$1.55	\$31.00
NE 9255	0.40¢	\$8.00	.....	.....	NE 9915	1.20	24.00	1.55	31.00
NE 9260	0.40	8.00	.....	.....	NE 9917	1.20	24.00	1.55	31.00
NE 9261	0.65	13.00	.....	.....	NE 9920	1.20	24.00	1.55	31.00
NE 9262	0.65	13.00	.....	.....	NE 9922	1.20	24.00	1.55	31.00
					NE 9925	1.20	24.00	1.55	31.00
					NE 52100A	.....	.....	\$2.60	\$52.00
					NE 52100B	.....	.....	2.60	52.00
					NE 52100C	.....	.....	2.60	52.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. Note 2: For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, A.I.S.I. Steel Products Manual. Note 3: When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and \$5 per gross ton for billets, blooms and slabs. Note 4: The extras shown are in addition to the base price of \$2.70 for 100 lb. on finished products and \$54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip, and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 800 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(*) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quantities.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% Fe, Natural Content, Delivered Lower Lake Ports*)

Per Gross Ton

Old range, bessemer, 51.50..... \$4.75

Old range, non-bessemer, 51.50..... 4.60

Mesaba, bessemer, 51.50..... 4.60

Mesaba, non-bessemer, 51.50..... 4.45

High phosphorus, 51.50..... 4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, \$30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Base price per short ton
70% or more.....\$33.00
65% but less than 70%..... 32.00
60% but less than 65%..... 31.00
Less than 60%..... 30.00

PRICES

SEMI-FINISHED STEEL

Ingots, Carbon, Re-rolling

Base per gross ton, f.o.b. mill.... \$31.00

Exceptions: Phoenix Iron Co. may charge \$38.75; Kaiser Co., \$43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., \$34.25; Pgh. Steel Co., \$33.10.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown..... \$26.00

Exceptions: Phoenix Iron Co. may charge \$43.00; Empire Sheet & Tinplate Co., \$39.25, f.o.b. Mansfield, Ohio; West Coast producers, \$48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., \$33.10.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh..... \$45.00

Exceptions: C/L delivered Detroit add \$2.00; delivered East Michigan add \$3.00. Connors Steel Co. may charge \$45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (re-rolling only). Prices delivered Detroit are \$2.00 higher; delivered E. Michigan, \$3 higher; f.o.b. Duluth, billets only, \$2.00 higher; billets f.o.b. Pacific ports are \$12 higher. Provo, \$11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

Per Gross Ton

Re-rolling..... \$34.00

Forging quality..... 40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton..... \$54.00
Price delivered Detroit \$2.00 higher; E. Michigan, \$3.00 higher.

Shell Steel

Per Gross Ton

2 in. to 12 in..... \$52.00

12 in. to 18 in..... 54.00

18 in. and over..... 56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are \$2.00 higher; E. Michigan, \$3 higher.

Price Exception: Follansbee Steel Corp. permitted to sell at \$13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of \$52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

Per Gross Ton

Open hearth or bessemer..... \$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

Per Lb.

Grooved, universal and sheared .. 1.90c.

Wire Rods

(No. 5 to 9/32 in.)

Per Lb.

Pittsburgh, Chicago, Cleveland ... 2.00c.

Worcester, Mass. 2.10c.

Birmingham 2.00c.

San Francisco 2.50c.

Galveston 2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

Base per lb.

High speed 67c.

Straight molybdenum 54c.

Tungsten-molybdenum 67 1/2c.

High-carbon-chromium 43c.

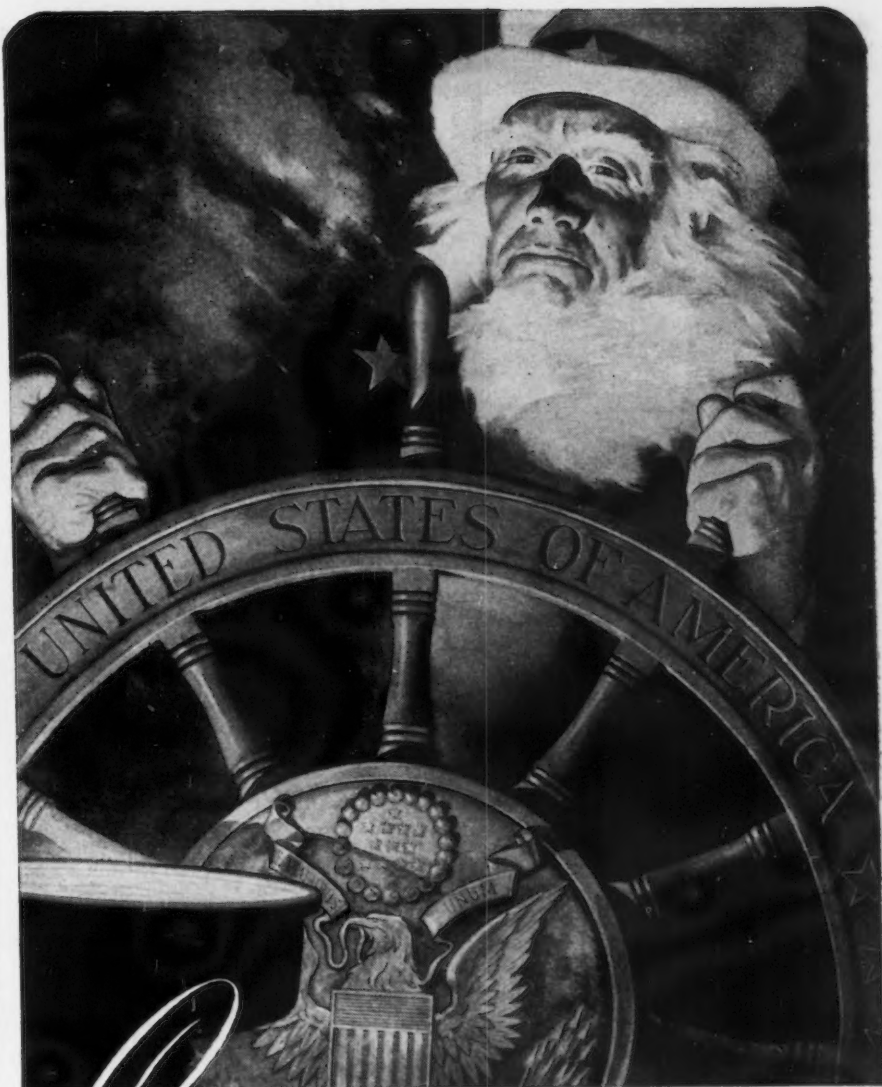
Oil hardening 24c.

Special carbon 22c.

Extra carbon 18c.

Regular carbon 14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.



Continuing on with Confidence—

FOR the second time in one generation this country is turning the tide of victory in a great war. Abroad, our armed forces have shown what free men can accomplish. At home, free enterprise has proved itself by the tremendous volume of its production.

Acme Aluminum Alloys, Inc. is itself a product of free enterprise. Little known in 1919, it is now among the leaders of its industry. The growth of companies like Acme is proof that the free enterprise system remains vigorous and strong.

Free men and free enterprise are steering this country through a great crisis. Free men and free enterprise can continue on with confidence, whatever the future may bring.

ACME

Aluminum Alloys, Inc.

Formerly Acme Pattern & Tool Co., Inc.

DAYTON 3, OHIO

PATTERNS • TOOLS • ALUMINUM CASTINGS • ENGINEERING

ARMSTRONG

New drawings, new operations, but the same ARMSTRONG TOOL HOLDERS

When war came, thousands of plants laid aside their prints and their gauges, re-arranged their schedules, and with the same ARMSTRONG TOOL HOLDERS which they had used for civilian manufacturing, turned to the production of war materials. In the same manner, after victory, it will be with new drawings and these same ARMSTRONG TOOL HOLDERS, that normal peace time production will be resumed on lathes, planes, slotters and shapers.

Permanent, multi-purpose tools, used in over 96% of the machine shops and tool rooms, ARMSTRONG TOOL HOLDERS are essential to American industry, in peace or war. They are the standard tools for basic machining operations, which with American ingenuity have built and will rebuild America's production greatness.

Whatever your post-war plan or product, you will probably start operation with ARMSTRONG TOOL HOLDERS. Check now to see that you are well supplied with the types and sizes you will need.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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199 Lafayette St., N. Y. 12, N. Y.
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1275 Mission St., San Francisco, Calif.

ARMSTRONG
CHICAGO U.S.A.

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District
and Lorain, Ohio, Mills
(F.o.b. Pittsburgh only on wrought pipe)
Base Price—\$200.00 per Net Ton

Steel (Butt Weld)

	Black	Galv.
1/2 in.	63 1/2	51
3/4 in.	66 1/2	55
1 to 3 in.	68 1/2	57 1/2

Wrought Iron (Butt Weld)

1/2 in.	24	3 1/2
3/4 in.	30	10
1 and 1 1/4 in.	34	16
1 1/2 in.	38	18 1/2
2 in.	37 1/2	18

Steel (Lap Weld)

2 in.	61	49 1/2
2 1/2 and 3 in.	64	52 1/2
3 1/2 to 6 in.	66	54 1/2

Wrought Iron (Lap Weld)

2 in.	30 1/2	12
2 1/2 to 3 1/2 in.	31 1/2	14 1/2
4 in.	33 1/2	18
4 1/2 to 8 in.	32 1/2	17

Steel (Butt, extra strong, plain ends)

1/2 in.	61 1/2	50 1/2
3/4 in.	65 1/2	54 1/2
1 to 3 in.	67	57

Wrought Iron (Same as Above)

1/2 in.	25	6
3/4 in.	31	12
1 to 2 in.	38	19 1/2

Steel (Lap, extra strong, plain ends)

2 in.	59	48 1/2
2 1/2 and 3 in.	63	52 1/2
3 1/2 to 6 in.	66 1/2	56

Wrought Iron (Same as Above)

2 in.	33 1/2	15 1/2
2 1/2 to 4 in.	39	22 1/2
4 1/2 to 6 in.	37 1/2	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or \$4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or \$2 a ton higher on all butt weld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago ...	\$54.50
6-in. and larger, del'd New York ...	52.20
6-in. and larger, Birmingham ...	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles ...	69.40
6-in. and larger f.o.b. cars, Seattle ...	71.20
Class "A" and gas pipe, \$3 extra; 4-in. pipe is \$3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are \$45 at Birmingham and \$53.80 delivered Chicago, \$59.40 at San Francisco and Los Angeles, and \$70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.	

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless	Weld,
	Cold Drawn	Hot Rolled
2 in. o.d. 13 B.W.G. 15.03	13.04	12.33
2 1/2 in. o.d. 13 B.W.G. 20.21	17.54	16.53
3 in. o.d. 12 B.W.G. 22.48	19.50	18.35
3 1/2 in. o.d. 11 B.W.G. 28.37	24.62	23.15
4 in. o.d. 10 B.W.G. 35.20	30.54	28.66

(Extras for less carload quantities)

	Base
40,000 lb. or ft. and over ...	5%
30,000 lb. or ft. to 39,999 lb. or ft. ...	10%
20,000 lb. or ft. to 29,999 lb. or ft. ...	20%
10,000 lb. or ft. to 19,999 lb. or ft. ...	30%
5,000 lb. or ft. to 9,999 lb. or ft. ...	45%
2,000 lb. or ft. to 4,999 lb. or ft. ...	65%
Under 2,000 lb. or ft.	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails....	\$2.55	\$3.05
Coated nails.....	2.55	3.05
Cut nails, carloads...	3.85	...
	Base per 100 lb.	
Annealed fence wire...	\$3.05	\$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*...	.67	.85
Fence posts, carloads..	.69	.86
Single loop bale ties...	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbed wire..	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
¼ in. & smaller x 6 in. & shorter...	65½
3/16 & ½ in. x 6 in. & shorter....	63½
¾ to 1 in. x 6 in. shorter.....	61
1½ in. and larger, all lengths.....	59
All diameters over 6 in. long.....	59
Lag, all sizes.....	62
Flow bolts.....	65

Nuts, Cold Punched or Hot Pressed:

(Hexagon or Square)

¼ in. and smaller.....	62
3/16 to 1 in. inclusive.....	59
1½ to 1½ in. inclusive.....	57
1½ in. and larger.....	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts U.S.S. S.A.E.

Base discount less keg lots

7/16 in. and smaller.....	64
½ in. and smaller.....	62
¾ in. through 1 in.....	60
3/16 in. through 1 in.....	59
1½ in. through 1½ in.....	57
1½ in. and larger.....	56

In full keg lots, 10 per cent additional discount.

Stove Bolts

Consumer

Packages, nuts loose.....	71 and 10
In packages, with nuts attached....	71
In bulk.....	60

On stove bolts freight allowed up to 35c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

Base per 100 Lb.

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham.....	\$3.75
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Small Rivets

(7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham.....	65 and 5
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Cap and Set Screws

Consumer

Per Cent Off List

Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.....	64
Upset set screws, cup and oval points	71
Milled studs.....	46
Flat head cap screws, listed sizes....	36
Fillister head cap, listed sizes.....	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C....	\$6.00	\$12.00
15-lb. coating I.C....	7.00	14.00
30-lb. coating I.C....	7.50	15.00

Make this Simple Test



This 10-second test will quickly show you why a flexible coupling is mighty important to the life of direct-connected machines.

Just try to hold a couple of pencils in perfect alignment without touching each other, and see what happens.

Ajax Flexible Couplings provide a positive but resilient connection between driving and driven shafts. They make it possible for each shaft to rotate around its own axis without creating vibration, chatter, strain on bearings, drag, power loss, reversal of torque and other detrimental factors.

Ajax interlocking drive studs held by rubber-bushed graphited-bronze bearings assure maximum flexibility, quiet operation, and complete elimination of lubrication problems.

Make the 10-second "pencil test"—then write for Facts on Ajax Flexible Couplings. *

AJAX

Flexible Coupling Co. Inc.
WESTFIELD, N. Y.

Incorporated 1920

PRICES

PIG IRON

All prices set in bold face type are maximum established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maximum. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston.....	\$25.50	\$25.00	\$26.50	\$26.00	.....	.....
Brooklyn.....	27.50	27.00	.....	28.00	.....	.....
Jersey City.....	26.53	26.03	27.53	27.03	.....	.....
Philadelphia (4).....	25.84	25.34	26.84	26.34	\$30.74	.....
Bethlehem, Pa.....	\$25.00	\$24.50	\$26.00	\$25.50	.....	.....
Everett, Mass.....	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.....	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.....	.....	24.50	.....	.....	\$29.50	.....
Birdsboro, Pa. (3).....	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.....	25.00	24.50	.....	.....	.....	.....
Erie, Pa.....	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.....	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1).....	24.00	23.50	24.50	24.00	.....	.....
Buffalo.....	24.00	23.00	25.06	24.50	29.50	.....
Cincinnati, Ohio.....	25.11	24.61	.....	25.11	.....	.....
Canton, Ohio.....	25.39	24.89	25.89	25.39	32.69	.....
Mansfield, Ohio.....	25.94	25.44	26.44	25.94	32.66	.....
St. Louis.....	24.50	24.50	.....	.....	.....	.....
Chicago.....	24.00	23.50	24.50	24.00	35.66	\$37.34
Granite City, Ill.....	24.00	23.50	24.50	24.00	.....	.....
Cleveland.....	24.00	23.50	24.50	24.00	32.42	.....
Hamilton, Ohio.....	24.00	23.50	.....	24.00	.....	.....
Toledo.....	24.00	23.50	24.50	24.00	.....	.....
Youngstown.....	24.00	23.50	24.50	24.00	32.42	.....
Detroit.....	24.00	23.50	24.50	24.00	.....	.....
Lake Superior Fe.....	.....	.....	.....	.....	.....	34.00
Lyles, Tenn., Fe. (2).....	.....	.....	.....	.....	.....	33.00
St. Paul.....	26.63	26.13	27.1	26.63	39.80	.....
Duluth.....	24.50	24.00	25.00	24.50	.....	.....
Birmingham.....	26.38	25.88	26.88	.....	.....	.....
Los Angeles.....	26.95	.....	.....	.....	.....	.....
San Francisco.....	26.95	.....	.....	.....	.....	.....
Seattle.....	26.95	.....	.....	.....	.....	.....
Provo, Utah.....	22.00	21.50	.....	.....	.....	.....
Montreal.....	27.50	27.50	.....	28.00	.....	.....
Toronto.....	25.50	25.50	.....	26.00	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace..... \$23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron & Steel Co. may add another \$1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorus iron; high phosphorus sells for \$28.50 at the furnace.

(3) E. & G. Brooke Co., Birdsboro, Pa., permitted to charge \$1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge \$2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, \$2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and \$1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh..... 21½ to 23½c.

Copper, reduced, 150 and 200 mesh..... 20½ to 25½c.

Iron, commercial, 100 and 200 mesh 96 + % Fe..... 13½ to 15c.

Iron, crushed, 200 mesh and finer, 90 + % Fe, carload lots..... 4c.

Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots..... 63c.

Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe 30 to 33c.

Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe..... 42c.

Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe..... 90c.

Aluminum, 100 and 200 mesh..... 23 to 27c.

Antimony, 100 mesh..... 20.6c.

Cadmium, 100 mesh..... \$1.

Chromium, 150 mesh..... \$1.03.

Lead, 100, 200 & 300 mesh, 11½ to 12½c.

Manganese, 150 mesh..... 51c.

Nickel, 150 mesh..... 51½c.

Solder powder, 100 mesh, 8½c. plus metal.

Tin, 100 mesh..... 58½c.

Tungsten metal powder, 98%-99%, any quantity, per lb. \$2.60

Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb. \$2.60

Under 100 lb. \$3.00

*Freight allowed east of Mississippi.

COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.....	\$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.....	8.10
Connellsville, Pa.....	8.25
Foundry, By-Product	
Chicago, del'd.....	13.35
Chicago, f.o.b.....	12.60
New England, del'd.....	14.25
Kearny, N. J., f.o.b.....	12.65
Philadelphia, del'd.....	12.85
Buffalo, del'd.....	13.00
Portsmouth, Ohio, f.o.b.....	11.10
Painesville, Ohio, f.o.b.....	11.75
Erie, del'd.....	12.75
Cleveland, del'd.....	12.30
Cincinnati, del'd.....	12.85
St. Louis, del'd.....	13.85
Birmingham, del'd.....	10.50

*Hand drawn ovens using trucked coal permitted to charge \$7.75 per ton plus transportation charges.

STUDYING STRAINS as revealed in PLASTIC GEAR MODELS

•Of interest to engineers is our new method of observing actual stresses in meshing gear teeth. Photoelastic equipment is used, in these tests, to check visually on mathematical calculations of stresses and strains. A polarized light is passed through transparent gear models and the image on the screen shows in color the lines of stress which develop in the meshing teeth. By substituting a camera for the screen, permanent records of tooth stresses can be made.

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Backed by 25 years of experience in making gears, plus careful research work and latest methods of inspection, Fairfield is able to build into gears that special, superior quality essential for satisfactory use.

With an eye to the future, investigate Fairfield's facilities for making fine gears to order. Write for our brochure on gears.



PRICES

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	\$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Sec. quality, New Jersey	51.00
No. 1 Ohio	43.00
Ground fire clay, net ton	7.60

Silica Brick

Pennsylvania and Birmingham	\$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00

Chrome Brick

	Per Net ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	\$54.00

Magnesite Brick

Standard, Balt. and Chester	\$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester	
In sacks (carloads)	\$43.48
Domestic, f.o.b. Chewelah, Wash.	
(In bulk)	22.00

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	\$40.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	Per Gross Ton
Light rails (from billets)	\$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plate, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5
Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Welton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.	

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.*

*Includes annealing and pickling.

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.
F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.	

“99”

just one year shy of
a century of springmaking...and believe us,
we've seen a lot of life...panics...wars...boom
times...bum times...but we believe in our
country and our cause...and we stick to
our knitting because we want to be
“Everybody's Spring Dept.”

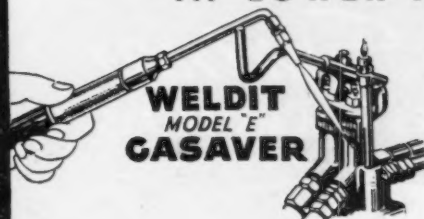


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AT LOWER PRODUCTION COSTS



**WELDIT
MODEL "E"
GASAVER**

The Weldit Gasaver shuts off the welding flame when not in use. . . . Conserves essential materials by cutting oxygen and acetylene consumption as much as fifty per cent. Prevents injury to workmen—or sudden fires—from dangerous idle torch flames. . . . Adjustment remains unaltered between welds.

When the Weldit Gasaver has been installed, you simply hang idle torch on the handy lever rod. Weight of torch pulls rod down, thus automatically shutting off supply lines. Relight instantly by passing torch over Gasaver pilot light. No bother. . . . No time lost. . . . No readjusting required. . . . Price \$10.00 at Detroit. Order today.

Better Soldering, Annealing and Heating Jobs

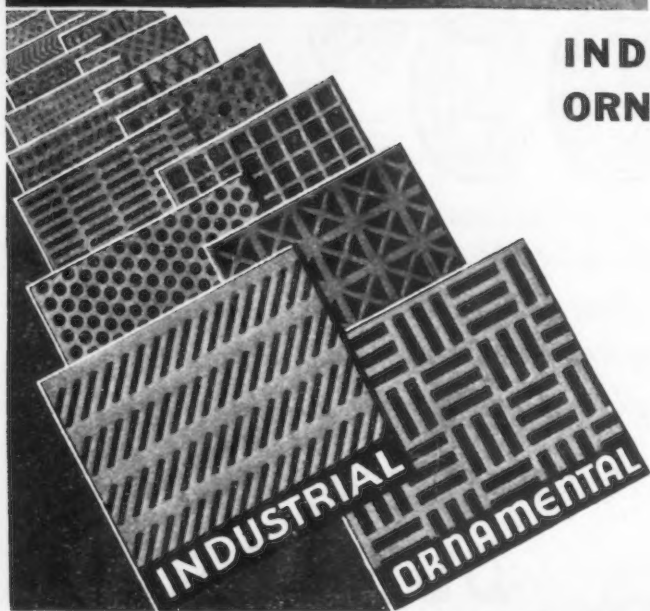


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TORCH**

The Weldit Model CW Blowpipe is in daily use by many foremost industrial plants. . . . Built in accordance with the recommendations of leading fabricators of sheet metal products. . . . Operates on either natural gas, manufactured gas, or other low temperature fuel gas and compressed air. Stands up under rough shop use. . . . Send for literature.

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LEE SPRING COMPANY, Inc.
30 MAIN STREET BROOKLYN, N. Y.



PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.
Carload lots (bulk)\$135.00
Carload lots (packed) 141.00
Less ton lots (packed) 143.50
\$1.70 for each 1% above 82% Mn; penalty, \$1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.
96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.
Carload, bulk 36c.
L.c.l. lots 33c.
95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.
Carload, bulk 34c.
L.c.l. lots 35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.
16-19% Mn 19-21% Mn
3% max. Si 3% max. Si
Carloads \$35.00 \$36.00
Less ton 47.50 48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed.

	Eastern Zone	Central Zone	Western Zone
50% Si ...	6.65c.	7.10c.	7.25c.
75% Si ...	8.05c.	8.20c.	8.75c.
90-90% Si ...	8.90c.	9.05c.	9.55c.
90-95% Si ...	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

(C/L, Per Gross Ton, base 6.00 to 6.50 Si)
F.o.b. Jackson, Ohio \$29.50*
Buffalo 30.75*

For each additional 0.50% silicon add \$1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add \$1 a ton for 0.75% phosphorous or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are \$1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for L.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb. ...	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr, 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.90% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.
62-66% Cr, 5-7% C	13.50c.	13.90c.	14.50c.

PRICES

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2c. per lb. to regular low-carbon ferrochrome price schedule. Add 2c. for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add 5c. per lb. to regular high-carbon ferrochrome price schedule.

Low-Carbon Ferromanganese

Contract prices per lb. of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, Eastern Zone. Add 0.25c. for spot sales.

	Carloads, Ton	Less Bulk	Ton
0.10% max. C, 1			
or 2% max. Si	23.00c.	23.40c.	23.65c.
0.15% max. C, 1			
or 2% max. Si	22.00c.	22.40c.	22.65c.
0.30% max. C, 1			
or 2% max. Si	21.00c.	21.40c.	21.65c.
0.50% max. C, 1			
or 2% max. Si	20.00c.	20.40c.	20.65c.
0.75% max. C, 1			
7.00% max. Si	16.00c.	16.40c.	16.65c.

Ferrochrome Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 60 per cent contained chromium. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk..	8.25c.	8.55c.	8.95c.
Ton lots	8.75c.	9.25c.	10.75c.
Less ton lots ..	9.00c.	9.50c.	11.00c.

Ferromanganese Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 66 per cent contained manganese. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk ..	6.05c.	6.30c.	6.60c.
Ton lots	6.55c.	7.55c.	8.55c.
Less ton lots ..	6.80c.	7.80c.	8.80c.

Calcium—Manganese—Silicon

Contract prices per lb. of alloy, lump size, f.o.b. shipping point, freight allowed to destination.

16-20% Ca, 14-18% Mn, 53-59% Si. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carloads	15.50c.	16.00c.	18.05c.
Ton lots	16.50c.	17.35c.	19.10c.
Less ton lots ..	17.00c.	17.85c.	19.60c.

Calcium Metal

Eastern zone contract prices per lb. of metal, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. Add 0.9c. for Central Zone; 0.49c. for Western Zone.

	Cast	Turnings	Distilled
Ton lots	\$1.80	\$2.30	\$5.00
Less ton lots ..	2.30	2.80	5.75

Chromium—Copper

Contract price per lb. of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi River. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add 2c. for spot sales.

Shot or ingot 45c.

Ferroboration

Contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	\$1.20	\$1.2075	\$1.229
Less ton lots ..	1.30	1.3075	1.329

Manganese—Boron

Contract prices per lb. of alloy, f.o.b. shipping point, freight charges allowed. Add 5c. for spot sales. 75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots ...	\$1.89	\$1.903	\$1.935
Less ton lots ..	2.01	2.023	2.055

Nickel—Boron

Spot and contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination.

15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

	Eastern Zone	Central Zone	Western Zone
11.200 lb.			
or more ..	\$1.90	\$1.9125	\$1.9445
Ton lots ...	2.00	2.0125	2.0445
Less ton lots ..	2.10	2.1125	2.1445

Other Ferroalloys

Ferrotungsten, Standard grade, lump or 1/4" down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more.... \$1.90

Ferrovandium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.

Open hearth	\$2.70
Crucible	\$2.80
Primus	\$2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal..... \$1.50

Vanadium pentoxide, 88%-92% V₂O₅ technical grade, contract basis, any quantity, per lb. contained V₂O₅. Spot sales add 6c. per lb. contained V₂O₅..... \$1.10

Ferroboration, contract basis, 17.50% min., B, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.

2000 lb. to carload.....	\$1.20
Under 2000 lb.....	1.30

Silicaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)

Carload lots	25c.
2000 lb. to carload.....	26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)

Carload lots	58c.
2000 lb. to carload	59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis

No. 1	87.5c.
No. 6	60c.
No. 79	45c.

Bortram, f.o.b. Niagara Falls

Ton lots, per lb.....	45c.
Less ton lots, per lb.....	50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.

2000 lb. lots.....	\$2.25
Under 2000 lb. lots.....	\$2.30

Ferrotitanium, 40%-45%, 0.10% C, max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti.

Less ton lots	\$1.23
Less ton lots	\$1.25

Ferrotitanium, 20%-25%, 0.10% C, max., ton lots, per lb. contained titanium

Less ton lots	\$1.35
Less ton lots	\$1.40

High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload..... \$142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with \$3 unitage freight equalled with Rockdale, Tenn., per gross ton..... \$58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Silo), Tenn., \$3 unitage freight equalled with Nashville, per gross ton

.....	\$75.00
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Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo.

.....	95c.
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Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo.

.....	80c.
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Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo.

.....	80c.
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Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo.

.....	80c.
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Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add 1/4c. for spot sales

Carload lots	14c.
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Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy

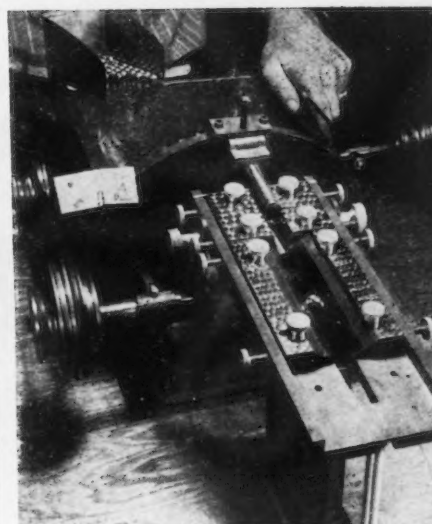
Carload, bulk	4.6c.
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Alsilfer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk

Ton lots	5.75c.
.....	7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.

Car lots	8.75c.
Ton lots	9.25c.



This type gauging machine with honed steel ways, set finer than .000025", is used to gauge all "Universal" Precision Balls to accurate and exact size.

The Peak of PRECISION

Man approached the peak of precision when he designed, built and floated safely across the rough waters of the English Channel, two harbors complete with unloading equipment.

There, maneuvered into perfect alignment and scuttled, dozens of battle-scarred craft formed a jetty behind which incoming ships unloaded their precious cargoes in quiet waters.

Continuous lines of ships moved through mine swept channels unloading mountainous quantities of war materials on a schedule so precise as to dumbfound the enemy. When history is written this accomplishment will embrace the very peak of military precision.

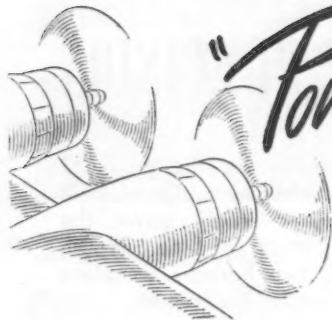
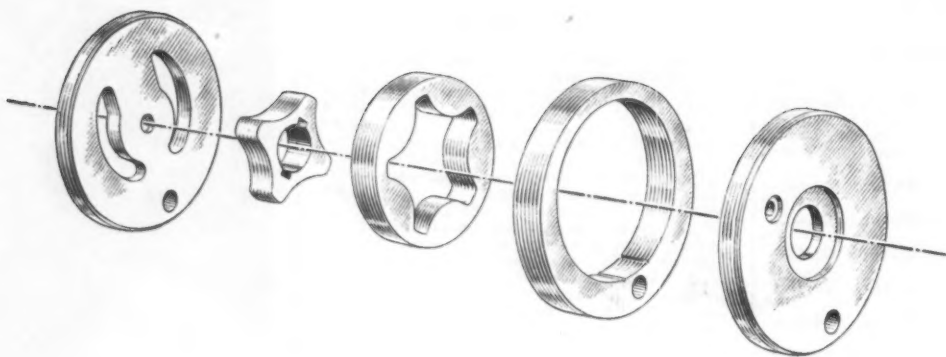
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"Power House" in a Mass-Precision Package

Operating at 4,000 R.P.M. and delivering oil at 1,200 P.S.I. may sound like a "tall order" for this small assembly of parts. Yet these requirements headed the list when a leading aircraft equipment manufacturer asked Nichols to produce an interchangeable precision unit which would power hydraulically the feathering action of a propeller in every extreme of temperature.

Feathering a propeller calls for "flick-of-the-switch" response from this mechanism to deliver full pressure *instantly* to stop "windmilling."

Trouble-free performance such as this depends on extremely fine finish and critical dimensions in every part.

Here's how Nichols is producing this "precision package": Flatness and parallelism of the two sides are held to .00015" over a two-inch span...thickness of the gerotors to $\pm .0001$ "...special lapping provides high surface finishes even on the rolled bronze part where normal lapping methods would charge the surface. All parts are assembled without pre-selection—which means low-cost production—and are enclosed in a housing.

The solution to one of your product problems may be found in introducing into your design the same basic idea that proved so successful here: localizing the difficult-to-make precision unit in a self-contained, removable assembly which does not depend on the housing for clearances and close fits. Then let "Accurate" Nichols build it.

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"Accurate" *Nichols*



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